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L. A. KIRKPATRICK.

Practical Nursing

INCLUDING

HYGIENE AND DIETETICS

BY THE LATE

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SEVENTH EDITION

REWRITTEN AND ENLARGED BY

W. T. GORDON PUGH

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PREFACE TO SEVENTH EDITION.

The gratifying reception given to the last edition showed that there had been need for a book specially written for the newly instituted examinations. In the present edition over one hundred pages and fifty illustrations have been added, and full advantage has been taken of the opportunity to keep the work abreast of the continuous advance of medical science. Of the new matters dealt with, the principal will be found in the sections concerned with milk and dietetics, ward work and hospital administration, diabetes and insulin treatment, infant feeding and the diseases of childhood, the nursing of special operations and orthopædic cases, and the use of ultra-violet light and X-rays in diagnosis and treatment.

A new feature, which it is thought will prove valuable, is the inclusion in an Appendix of all the questions (except those on Anatomy and Physiology) which have been set at the written examinations of the General Nursing Council of England and Wales for the Certificates of General Nursing, Sick Children's Nurses, and Fever Nursing, from the beginning to the present time. They have been classified according to chapter, and reference is given to the pages on which the answers may be found. From them it is evident that a wide and varied knowledge is expected of

candidates ; and the fact that it has been possible thus to indicate the answers to all the questions shows that the endeavour to provide in a single text-book not only a detailed account of the methods of nursing but the information required regarding hygiene, dietetics, bacteriology, medicine, and surgery has not been without a measure of success.

W. T. G. P.

June 1927.

PREFACE TO SIXTH EDITION.

In the summer of 1921 Dr Herbert Cuff and the writer arranged to revise 'Practical Nursing,' and to enlarge it so that it would include, apart from Anatomy and Physiology, all the subjects of importance to nurses studying in general, fever, tuberculosis, and children's hospitals. A few days later, in a gallant but unavailing attempt to save his two young daughters from drowning, Dr Cuff lost his life, to the lasting sorrow of his many friends, and on the writer fell the responsibility of rewriting the book.

In the preparation of this edition of the work particular care has been taken to maintain its practical character, the importance of which was emphasised in the preface to the first edition issued nearly a quarter of a century ago. The subjects dealt with cover the curriculum of training in nursing, hygiene, and dietetics required to qualify not only for the English and Scottish Registers of General Nurses, but also for the Supplementary Registers which have been established in connection with Fever Nursing and the Nursing of Sick Children. This will doubtless be appreciated by the many nurses who commence their professional career at fever or children's hospitals, with the intention of qualifying later for enrolment on the Register of General

Nurses, and who will find an advantage in using the same text-book throughout. To enable probationers the more readily to select the subjects which appertain to the branch of nursing in which they are training, an appendix is given in which the items specified in the several examination syllabuses are indicated chapter by chapter.

The revision has been extensive, more than three-quarters of the book being new. The writer gratefully acknowledges the help of many kind friends, and his indebtedness to numerous articles and works on medical, surgical, and nursing subjects. He would also thank Messrs Allen & Hanbury, Ltd., for providing a number of the illustrations.

W. T. G. P.

April 1924.

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Practical Nursing.

INTRODUCTION.

CHAPTER I.

THE HISTORY AND ETHICS OF NURSING.

I. Historical.

In Olden Days.—Although nursing the sick must have been one of the first occupations of women, there is little detailed record of it prior to the advent of Christianity. Phœbe (A.D. 60), the friend of St Paul, was the first of the order of deaconesses, whose duty it was to attend the sick in their homes; the lives of these pious women, spent in unselfish devotion, have served as an example in all charitable work. In the course of time hospices for the sick arose along the pilgrim routes to Palestine, and homes for the infirm gradually developed as adjuncts to churches and monasteries, the nursing being undertaken by monks and nuns. Thus for many centuries nursing was regarded as a form of religious devotion.

About the middle of the sixteenth century the English monasteries were suppressed by Henry VIII. The infirmaries attached to them were closed, the nursing brethren and sisters went abroad, and for a time no places of

refuge existed for the sick and dying poor. When the infirmaries reopened and new hospitals were built, there was no experienced organisation to undertake the nursing; the pious motive which had brought gentlewomen into the ranks was gone, and they were staffed by paid women. The work thus gradually fell into the hands of the lowly-born and ignorant, and as a consequence the training, the work, and the status of nurses deteriorated lamentably. A description of nursing under the conditions which prevailed during the next two centuries would appal those accustomed to present-day standards.

On the Continent the change had not been so drastic. Nursing orders had arisen as secular societies, whose members were not nuns and took no perpetual vow, although religious ceremonial formed an important part of their daily life. Most widely known were the Sisters of Charity of the Order of St Vincent de Paul: this order, founded in 1633, is still the largest nursing organisation in the world.

The Evolution of Modern Nursing.—Impressed by the work of Elizabeth Fry in English prisons and of Amalie Sieveking in the hospitals of Hamburg, Pastor Fliedner and his wife established, in 1836, the Kaiserswerth Deaconesses' Institution at Düsseldorf as a hospital for the sick poor and as a training school for Protestant nurses. This, in its turn, inspired Mrs Fry to form the Institution of Nursing Sisters in London in 1840, and Charles Dickens, in 'Martin Chuzzlewit' (1844), aided the cause of reform by creating Sairy Gamp and Betsey Prig. About the same time the Tractarian movement led many ladies of education, filled with religious enthusiasm, to desire to help in the care of the sick and the destitute, with the result that the Anglican Sisterhood of St John's House was founded in 1847. In 1854 came the war in the Crimea, and Florence Nightingale (born 1820, died 1910), who had been trained at the Kaiserswerth Institution, was sent to reorganise the very imperfect nursing arrangements there. The scandal of the Crimea attracted further attention to the need for an improvement in the system of training, and the St John's House Sister-

hood shortly afterwards undertook the nursing of King's College Hospital. In 1860 the Nightingale Fund Training School for Nurses was founded in connection with the old St Thomas's Hospital, the scheme being endowed with the money subscribed by the nation as a tribute to Miss Nightingale, and between 1870 and 1880 all the leading hospitals instituted similar training schools. The remarkable progress of medicine and surgery which followed the far-reaching work of Pasteur (born 1822, died 1895) and Lister (born 1827, died 1912) completed the revolution of nursing, for the dignity of the calling was raised by the necessity for scientific cleanliness, and persons of a superior class were thus induced to adopt it. It has been well said that the development of modern nursing has been due to three very diverse influences—religion, war, and science.

State Registration.—The movement for the organisation of nurses on lines which would give them a professional status began in 1887, and after a prolonged struggle the Nurses Registration Act was passed in 1919. Under this Act a General Nursing Council was appointed for England and Wales, and another for Scotland. It is the Councils' duty to make rules for the training of nurses and for the holding of examinations, and to ensure that the prescribed training and experience have been obtained before admission to the registers is granted.

II. The Qualities of a Good Nurse.

To become a good nurse, a woman must possess considerable intelligence, a good education, healthy physique, good manners, an even temper, a sympathetic temperament, and deft clever hands. To these she must add habits of observation, punctuality, obedience, cleanliness, a sense of proportion, and a capacity for and habit of accurate statement. Training can only strengthen these qualities and habits; it cannot produce them.

Of the necessary habits which a nurse should cultivate,

that of *observation* is the most important. A hospital ward is the only place where she can be taught what to see, and the value of what she sees. With carefully cultivated observation comes a sense of the relative proportions of things seen and heard. *Obedience* is the first duty of a nurse and the best test of her training, but it must not be the dull mechanical obedience of the ignorant or uninterested. The necessity and importance of *punctuality* and *cleanliness* should be obvious to every one. *Accuracy* implies more than the mere desire to be truthful. In social life it is not always easy; in official life the difficulty of conveying impressions, so as to place them before the mind of your listener in the light in which you yourself see them, may seem at times wellnigh insuperable.

III. The Duties of a Nurse.

The nurse has a fourfold duty to perform. She has her duty to her patient, to her medical officer, to her ward, and to herself.

The Patient must always be her first care; she must ever be on the alert to anticipate his wants and needs. She must be gentle but firm, striving to gain his confidence, and not fearing to use her authority when necessary.

Her manner towards her patients should be characterised by dignity and gentleness. The presence of a refined and courteous woman is sufficient under ordinary circumstances to maintain order in a ward. If reproof must be given, let it be done as quietly and briefly as possible, and not referred to again. Familiarity must always be avoided; but the nurse should show her patients, as she can in many little ways, a sympathetic willingness to help them, that her work is a pleasure, and that it is done ungrudgingly. She should be particularly gentle in her dealings with *new patients*, who often suffer much from nervous shyness and dread of the unknown when they first come to a hospital.

Quietness is a necessity for the sick. The nurse should

not wear rustling dresses or creaking shoes ; heels should have rubber tips. Rattling windows should be wedged and doors prevented from banging. Fires should be tended noiselessly ; they may be banked up at night and replenished with lumps, picked up quietly with paper or a glove.

The *friends of patients* are often somewhat of a trial to a nurse ; but she must remember that their anxiety and their apparently needless and troublesome questions are the natural result of untried circumstances. She should endeavour to win their confidence by listening attentively to whatever they have to say, as far as it bears on the patient's condition. At the same time, she should never give them her opinion of the case, but refer them to the sister of the ward, or the medical officer, for information.

As a *private nurse* she should be thorough but not fussy. In some cases the circumstances may render it necessary that she should assist in domestic work. She must remember that she is engaged as a help in time of distress, and should therefore be willing to perform duties in a small house which it would be quite unnecessary for her to undertake in a larger establishment. In any case it is her duty to cleanse utensils used by her patient, and dust the sick-room. She should also make her own bed and tidy her own room. She ought never to talk to one patient of the affairs or illness of another, but bear in mind that she has unusual and unavoidable opportunities of becoming acquainted with the private affairs of her patients, and that it would be a gross breach of confidence for her to make use of this knowledge. When her patient is visited by friends, she should, when possible, leave him alone with them, remaining within call, and intervening when she thinks the visit has lasted long enough.

To the Medical Attendant a nurse's first duty is obedience. In private practice, where more responsibility must be left to the nurse than in hospital, and where altered conditions sometimes justify a modification of the doctor's orders, her aim should be to proceed on lines likely to be

approved by him rather than on those she herself might choose. Any deviation, however small, should be at once reported to him. She should always do her utmost to promote her patient's faith in his medical attendant.

The Ward is best served by punctuality, orderliness, and economy. The nurse should go on duty at the precise moment laid down in the regulations, and at once get to work. Work should not only be begun at the proper hour, but, with rare exceptions, it should be finished at the proper time. Except in urgent cases, for which no rule can be laid down, nurses should endeavour to do their work in the same routine, and at the same time each day. This is what we mean by *method*, the possession of which enables one nurse to do so much more work than the best-intentioned woman without it. Nurses will find that the best method includes the habit of cleaning up as they go, putting away everything when they have done with it, clean, neat, and in its proper place.

There must also be a feeling of good-fellowship between the nurses, so that they are willing to help one another ; and a certain pride in the ward, leading each nurse to be anxious for its good name. Under these conditions the work becomes a pleasure, and is, moreover, the best that each member of the staff can give.

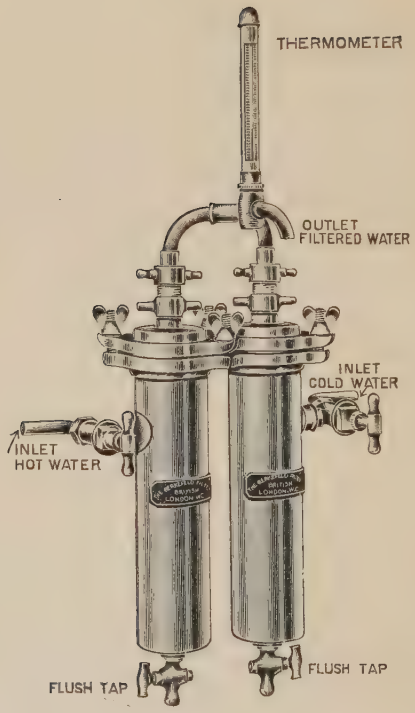
A Nurse's Duty to Herself can be divided into two parts—mental and physical. If she thinks, reads, and talks about nothing but nursing, she contracts her outlook on life, lessens her intelligence, decreases her capacity for assimilating new ideas, and becomes somewhat of a nuisance to her friends. A nurse's life, passed as it is amid scenes of sorrow and suffering—often the result of what she has been taught to consider sin,—is naturally depressing, and she tends to become morbid, introspective, and cramped. She will do well, therefore, to seize every legitimate means of *relaxation*. She should also keep up her interest in literature, public events, and whatever is new in her own profession. Relaxation is necessary in all professions, but in none more than in nursing. A healthy mind is as neces-

sary for a nurse as a healthy body, and that can only be attained by giving it a varied diet, plenty of work, and a sufficiency of play.

Nurses ought always to be most careful of their own *health*. If they are not so, they are less likely to be able to do their patients justice. They are very liable to suffer from sore throat and fatigue, while flat-foot and varicose veins are by no means uncommon. These ailments may to a certain extent be avoided by attention to simple rules of health. A nurse should, therefore, make a careful study of the paragraphs on *personal hygiene* (pp. 30-34) dealing with habits, exercises and recreation, rest, cleanliness, clothing, and the care of the feet. She should pay particular attention to neatness and cleanliness, especially of the hands and nails, take a daily bath, and clean her teeth morning and evening. Scents and scented soaps should be avoided, and any cause of offensive odour, such as decayed teeth, discharging ears, and perspiring feet, should be corrected.

IV. Hospital Etiquette.

The new probationer should, for her own sake, make herself early acquainted with the etiquette of hospital life, which is nothing more than common politeness officially expressed. She ought never to remain seated in the presence of a superior officer, nor when visitors are in the ward. She should learn to receive orders with deference and politeness. She should obey the written and unwritten laws of the hospital, respect its traditions, and so order her ways that no discredit may fall on it through want of thought on her part. At the same time, there is no need for a nurse to be aggressively polite. She must remember that the sister, when present, will take the lead in all things, and in her absence the senior nurse will act for her. A cheerfully polite manner is all that is required of a probationer, unless she is specially addressed.



Berkefeld Filter.

PART I.—HYGIENE AND DIETETICS.

CHAPTER II.

HYGIENE.

Public Health.—The health of the community is the care of the Public Health Service, which has among its many duties the provision of a good water-supply and an efficient sewerage; the removal of refuse; the supervision of the quality of food, by inspection of markets and slaughter-houses; the provision of isolation accommodation for notifiable infectious diseases; and the maintenance of hygienic conditions in the home, by supervision of house-building and prevention of overcrowding.

In recent years the duties have been extended in various directions, particularly in connection with the treatment of tuberculosis and venereal diseases, and the welfare of infants and children. The *school-child* is examined at regular intervals by school medical officers and nurses; treatment for dental caries, adenoids, and ringworm is provided; in many districts open-air schools are established for delicate children. Thus attention is now being paid by the Health Authorities, not only to the prevention of disease, but to its detection and treatment in the earliest stage. At *infant welfare centres*, advice and help are given to inexperienced mothers and those with delicate babies. Milk-depôts for infants and free meals for school-

children in necessitous cases are efforts in the same direction.

The importance of the mother's health is also recognised, and *ante-natal clinics* are now to be found in most towns. Care is taken that the expectant mother is provided with nourishing food, and lives under hygienic conditions. The danger of the transmission of disease is minimised, and examination is made so that any steps necessary to avoid complications in pregnancy and childbirth may be taken in good time.

Hygiene is "the science which treats of the preservation of health." Thus light, warmth, and fresh air are all essential to the maintenance of good health. How necessary must they be to those who are ill! Therefore, if a nurse wishes to do her best for the hygiene of her ward, she must see that excreta, soiled linen, and dirty dressings are at once removed; that bed-pans are always carried through the ward with a cover or a cloth on them; that the closets and various sinks are kept quite clean, and constantly flushed; that the water-closets are thoroughly ventilated, and the doors between them and the ward closed. Each time that she enters her ward she should observe the temperature and the atmosphere, and assure herself that adequate ventilation is being maintained.

A careful study of the following sections will enable the nurse to grasp the principles of hygiene, and thus benefit her own health and promote the wellbeing of her patients.

I. Air.

Composition.—In 100 volumes of dry air there are roughly 79 volumes of nitrogen and 21 volumes of oxygen, with a little carbonic acid. The atmosphere (*i.e.*, the air that surrounds the earth) also contains water vapour and various impurities. The function of the principal components may be briefly indicated. The *oxygen* is necessary to support combustion, and is indispensable to animals and vegetables. The *nitrogen* serves

to weaken the effect of the oxygen, which undiluted is a very powerful chemical agent: without the nitrogen, oxidation would go on too rapidly. The *carbonic acid*, while of no use to animals, is necessary for plants, which use it as a food, splitting it up in the presence of sunlight into oxygen, which is set free in the air, and carbon, which they incorporate in themselves.

Impurities.—Ordinary air, as already said, contains various impurities. *Respiration* produces carbonic acid gas in considerable amount, and the combustion of *coal* sets free carbonic acid, carbon monoxide, and sulphur compounds, in addition to particles of carbon in the form of soot. The burning of *gas* liberates the same gases but much less soot. It should be observed that carbon monoxide may enter the atmosphere in dangerous amount by an escape of gas, or sometimes through the use of coke or anthracite coal in a defective stove (p. 215). *Smoke pollution* of the atmosphere, besides covering cities and people with dirt and delaying transport by fog, destroys grass and plants and hinders the coming through of cheering and health-giving sunlight. *Dust* of all kinds is harmful, as it tends to produce asthma and bronchitis in later life. The air of *workrooms* is liable to be polluted, according to the nature of the trade, with particles of arsenic, lead, phosphorus, flax, flour, &c.

Nature's Remedies.—The large amount of impurity thus constantly entering the atmosphere in towns would in time make it unfit to support life, were it not for certain natural processes always going on, viz. :—

(1) The gases are continually being commingled by (*a*) the constant movement, or *diffusion*, of the particles of the gases; (*b*) the warmed air rising, and the cold air descending to take its place; and (*c*) the action of the wind.
(2) Vegetables and plants decompose the carbonic acid.
(3) Many impurities are washed from the air by the rain.
(4) Others are decomposed or oxidised.

Effects of Defective Ventilation.—*Ventilation* is

the process of supplying a house or room continuously with fresh air. The air of an ill-ventilated room has an excess of carbonic acid, is oppressive from its heat and moisture, and offensive from the emanations of its occupants. It is common knowledge that being in an ill-ventilated room causes sleepiness and headache and, not infrequently, fainting; and that a life spent constantly under such conditions leads to pallor, loss of appetite, and general debility, associated with a greatly increased liability to infectious diseases, especially tuberculosis. Dr Leonard Hill attaches more importance to the temperature and moistness of the air than to the chemical products of respiration. Thus, he says :—

(*a*) Re *Impairment of Health.*—The ordinary idea is that the stuffiness of a close room is due to the *chemical impurities* in the air, and that the benefits obtained from open-air treatment are owing to the fact of the air being chemically pure. So great, however, is the natural ventilation through chinks and crannies set up by differences of temperature and humidity between the inside and outside air, that chemical impurity has nothing to do with the stuffiness. In the air in the worst ventilated rooms the amount of *carbonic acid* is very little more than the percentage in the ordinary air. As regards the supposed existence of a subtle *organic poison* exhaled in the breath, there is no evidence that any such poison is exhaled.

The *temperature* and *humidity* of the air, on the other hand, are of great importance to health. We are always consuming food and producing body-heat by *metabolism* (*i.e.*, by chemical changes in the tissues). We have to get rid of our body-heat in order to keep ourselves at the normal body temperature. We do this by *radiation* (*i.e.*, the passage of heat from a heated body in waves to its colder surroundings, in the form of vibrations of the invisible ether which pervades the universe) and by *convection* (*i.e.*, air, warmed by contact with the skin, expanding and rising and so carrying the heat away). The fresher (*i.e.*, cooler and drier) the air the better this is effected.

Hard muscular work produces still more heat, and to

deal with this there is the emergency method of cooling the body by *evaporation* of water. In dry hot atmospheres sweating keeps the body temperature normal, but in moist hot atmospheres loss of heat by evaporation becomes difficult. Hot moist atmospheres, therefore, require that the metabolism shall be lowered greatly, and as a consequence the working efficiency is much less. If factories were properly swept with *moving air*, the workers would be stimulated to work and kept in better health. If one lives in warm rooms and does not take exercise, one does not breathe deeply; there is feeble circulation of the blood, and the abdominal organs are not massaged as they should be to keep the bowels moved.

(*b*) Re *Increased Susceptibility*.—In manufacturing trades where people are forced to work under shut-up conditions, higher death and tuberculosis rates are shown than among those employed in the open air. One cause of mischief is that it not rarely happens that in a group of persons there is a *carrier* of the germs of an infectious disease. A carrier of such organisms explosively scatters these out by speaking, coughing, and sneezing to quite a considerable distance, the *danger zone* being about one yard. The chance of the healthy person being infected is naturally much less if the room is well ventilated and the windows and doors are open.

Principles of Ventilation.—Ideally, then, the air should be free from dust and harmful impurities, and of a suitable temperature and humidity; further, there should be movement of the air and also some variation in its temperature, but it must be arranged that chills are not caused thereby. These are the conditions obtaining in open-air life, and as far as possible they should be adopted in indoor life. Closeness of the atmosphere is definite proof that these conditions are not being fulfilled.

It is usually laid down that to prevent the atmosphere becoming close, 3000 cubic feet of fresh air should be supplied every hour to each adult occupying a room, but that to avoid a draught the air should not be changed more than three times an hour; further, that for comfort a

sitting-room should have a temperature of about 60° F. In ordinary houses it may be difficult to comply with all these conditions in cold weather, with the result that living-rooms are often imperfectly ventilated. The *minimum cubic space* (*i.e.*, the length, width, and height of room multiplied together) required per head is : in a school, 100 ; a factory, 250 ; a barracks, 600 ; and a hospital, 1500 cubic feet.

1. **Natural Ventilation.**—It has already been said that natural ventilation is effected by diffusion, by movements of air produced by differences of temperature at different levels, and by wind. Let us now see how these natural processes are applied to rooms and wards.

(*a*) *Inlets.*—It will be readily understood that to avoid draught all inlets, or orifices by which cold fresh air is admitted, should be above the level of the head and directed upwards to the ceiling—unless, as in many hospitals, the air is passed over hot pipes, in which case they should be near the floor. In an ordinary sitting-room the inlets are properly the *open windows ;* if these are shut, the slits between the sashes and under the door, and the keyhole have to serve. If the latter are the only inlets, however, there is generally a draught, especially from under the door. Much of the fresh air goes straight to the chimney, but some gets warmed on the way there, and, rising to the ceiling, gently descends later into the room.

To minimise draught, various devices have been introduced in connection with the inlet :—

(1) *In Bird's method*, the lower sash of the window is raised a few inches, and the space beneath filled by a board. Air can then enter in an upward direction through the space between the two sashes.

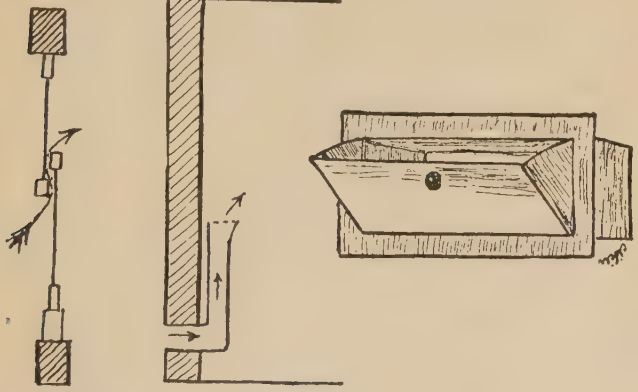
(2) *A Tobin's tube* may be placed on an external wall, opening to the exterior at the floor level and into the room 6 feet above that level. These tubes are not uncommon in the wards of older hospitals.

(3) *A Sherringham valve* may be inserted in an external wall about 6 feet from the floor. It consists of an iron box, into which cold air enters freely from

the outside, being directed upwards by a hinged flap, which falls into the room and can be adjusted at will.

In modern buildings, however, more reliance is placed on the open window.

(*b*) *Outlets.*—The obvious place for the outlet is the top of the room, since the escaping impure air is warmer, and therefore lighter, than the incoming fresh air. If the *window* is not open at the top, however, the *chimney* acts as the main outlet. It acts as such even without a fire,



Bird's method of ventilation. *Tobin's tube.* *Sherringham valve.*

owing to the aspirating action of the wind passing over its top: a down-draught can usually be prevented by the use of a cowl. In private houses a *Boyle's valve* is often used; it opens into the chimney near the ceiling, and its small talc plates swing so as to allow of the passage of air from the room but not in the reverse direction.

2. **Artificial Ventilation** is seldom used in private houses, although very necessary in buildings where large numbers of persons congregate, as in churches, theatres, factories, &c. There are two methods:—

(*a*) *By Propulsion*, when the air is warmed and filtered

from impurities, and then propelled by means of fans through ducts, opening about 7 feet above floor-level, to the various rooms. It is used in factories and workshops.

(*b*) *By Extraction,* when the air is drawn out of the buildings, either by fans, as in cotton-mills, where the air contains dust; or by a fire burning in a central air-shaft to which all the rooms are connected, as in the Houses of Parliament.

Ventilation of the Ward.—We have seen that *impure air* escapes from the ward by the chimney, through any windows which may be open from the top, and by ventilating outlets in or near the ceiling, while *fresh air* enters through the various ventilating inlets and windows. We have also seen that an excellent method of supplying patients with a constant supply of fresh air is by means of a large opening in the wall at the back of each bed, with a coil of hot pipes in front of it.

This latter method of ventilation is absent from many of the older general hospitals. The only inlets with which they are provided are Tobin's tubes and apertures in the upper part of the walls. These furnish the wards with a supply of fresh air which is quite inadequate to the needs of its inmates. In such a case it is of the highest importance that the windows should be constantly open at the top, so that foul air may escape and fresh air enter to take its place. This does not necessarily entail a *draught.* Even in windy weather the nurse may minimise draughts by skilful manipulation of the windows, partially or even completely closing those on the windward, and more freely opening those on the leeward, side. A good *fire* kept constantly burning is useful in the cold weather, not only for the sake of warmth, but also for the help that it is in ventilation by drawing foul air out of the ward.

A nurse should not regard the door of her ward as a means of ventilation. In many of the older hospitals the only result of leaving the door open is to allow the close air from ill-ventilated passages to invade the ward. In the

more recently built hospitals, with broad stone corridors well provided with windows, this objection does not hold good; at the same time it must be remembered that an open door is capable of producing a very unpleasant draught.

Climate is the characteristic weather of any place. It is governed by the latitude, elevation, distance from the sea, proximity of mountain ranges, soil, vegetation, &c. The most important climatic elements are :—

(*a*) *Temperature.*—This depends especially upon the *latitude* (the farther the place from the equator the more oblique are the solar rays, and the thicker the layer of atmosphere they have to traverse; less heat thus passes through) and on the *elevation* (the higher the elevation the less dense is the screen of vapour or cloud which protects the earth's surface from loss—through radiation into space—of the heat which it has absorbed from the sun).

(*b*) *Moisture*—in its various forms, as rainfall, cloudiness, and humidity. Moisture in the air is the result of *evaporation* (which means the conversion of a liquid or solid into vapour or gas) of water from the earth's surface. *Mountain ranges* compel wind to rise to the upper regions, where the coldness causes condensation of its moisture. Places to leeward of them thus have a lower rainfall and less cloud; this makes their summers hotter and winters colder.

(*c*) *Wind.*—The mildness of the British Isles, for example, is mainly attributable to the fact that the prevailing wind is from the south-west, and has passed over a vast expanse of ocean.

Atmospheric Pressure is the pressure on everything on the surface of the earth which results from the weight of the atmosphere. The atmosphere extends in a highly rarefied state to a height of about two hundred miles. The pressure naturally decreases the higher we ascend above sea-level, where it is nearly 15 lb. to the square inch; it also varies with the amount of moisture in the air. It can be measured by means of a *barometer*. It is this pressure which causes water to rise in a syringe when, by the withdrawal of the piston, a vacuum is created.

II. Heating.

Heat may be communicated by *radiation* from a hot body at a distance, as in the case of an open fire; or by *convection*, as when it is carried by the movement upwards of hot air in heating by steam or hot-water pipes; or by *conduction*, as when one end of an iron bar is heated and the other end gets hot. In heating a house or a ward we depend on radiation and convection.

A. **Radiation.**—Radiant heat travels in straight lines, the effect lessening rapidly as the distance increases. When it falls on a solid body, some is absorbed and some reflected. It is the most commonly used, and also the most wasteful, form of heat.

In an *open fire* over three-quarters of the heat goes up the chimney, and a large amount of impurity is added to the external atmosphere. The room is not warmed equally, and cold draughts are apt to be produced. Open fires, nevertheless, have many advantages. The air retains an agreeable moisture, the draught up the chimney is an excellent extractor of impure air, and the appearance is bright and cheerful. In the most economical fireplaces, *e.g.*, *Teale's*, fire-brick is used as far as possible instead of iron; the fire-brick back leans over the fire; the bottom is deep from before backwards, and its slits are narrow; while the space beneath the fire is closed in front by a closely-fitting iron shield. The fire-brick radiates into the room heat which otherwise might be lost up the chimney; and the shield keeps out the cold air, and thus secures as complete combustion of the coal as possible. In a *Galton's grate* warming is combined with ventilation. Behind the open grate is an air-chamber, into which air passes by means of an inlet flue from the outside; after being warmed the air ascends in a duct to enter the room through an opening near the ceiling.

Stoves are usually made of cast or wrought iron, and should be so placed that the products of combustion escape

by flue or chimney to the open air, while the heat radiates in all directions round the stove. They heat partly through convection by the warm surrounding air. They are economical, but their ventilating effect is much less than that of open fires. *Gas-fires* now usually consist of a number of perforated fire-clay tubes surrounding a Bunsen flame, the products of combustion passing up the chimney. *Electric radiators* give out heat without adding impurity to the atmosphere. All three, however, heat the air so much that it feels unpleasantly dry; an attempt may be made to prevent this to some extent by placing a dish of water near so that a little may evaporate and make the air feel more moist. Gas and electric radiators are considerably more expensive than coal fires.

B. **Convection.**—Owing to the great convenience, pipes containing steam or hot water are largely used for warming large buildings such as hospitals, hotels, and churches. The hot water may be either at low pressure in pipes about 3 in. in diameter, or at a much higher pressure and temperature in a narrower pipe. The boiler is placed in the basement, and the hot water circulates upwards through pipes branching into the several rooms, and returns, as it cools and thus becomes heavier, through return pipes to the boiler. Radiators connected with the pipes are often installed under the windows with a fresh-air inlet behind them, in order to warm the incoming air. In some systems the hot water is pumped round, and the circulation is then independent of gravity.

Measurement of Temperature. — Temperature is measured by a graduated thermometer, usually containing mercury. In this country the Fahrenheit scale is in common use; on the Continent and in scientific work, the Centigrade thermometer. On the former scale the freezing-point is 32° F. and the boiling-point 212° F., the scale between being divided into 180 parts. The Centigrade scale, on the other hand, is divided into 100 parts, the freezing-point being 0° C., and the boiling-point 100° C.

To convert a temperature on the Centigrade scale to its equivalent on the Fahrenheit scale, multiply the Centigrade figure by 9 and divide the result by 5, and then add 32. Similarly, to convert from the Fahrenheit to the Centigrade scale, substract 32, multiply the result by 5, and divide the product by 9. If this is done it will be found, for example, that 99° F. equals 37.2° C., 104° F. equals 40° C., &c.

III. Lighting.

Lighting of the Ward.—The more sunshine and light that a nurse can introduce into her ward the better for her patients. There are, of course, certain cases for which light is harmful, while no patient likes to have the sun glaring in his eyes. If it is doing so, the nurse must pull down a blind, not forgetting to draw it up again when the sun has passed. With these exceptions, sunlight does nothing but good: it is good both for mind and body. Moreover, it helps to purify the atmosphere of the ward, since it is inimical to the growth of germs.

Apart from electricity, the principal sources of **Artificial Light** are candles, paraffin-oil, and coal gas. The chief products of the combustion of these are carbonic acid and water, with the addition, in the case of gas, of sulphur compounds, which are destructive to gilt picture-frames, curtains, brass-work, flowers, &c. Electric light has the advantage that it uses up none of the air of the room and gives off no impurities, whereas a single gas-burner consumes more than twice as much air per hour as is required by an adult. For the same amount of illumination, electric light and candles are the most expensive; gas costs about the same as oil.

Gas is obtained by the distillation of coal, and consists of a mixture of gases, which may be classified into *illuminants* (olefiant gas, acetylene, and benzene vapour), *heat producers* (hydrogen, carbon monoxide, and marsh gas), and *impurities* (nitrogen, carbonic acid, and sulphur compounds). In the days of the flat-flame and Argand burners, the illumi-

nants were the important constituents, and the heat producers were only of value when gas was used for heating and cooking. Nowadays, however, even the lighting depends largely on the heat producers, for "mantles" are in general use, which become intensely luminous when heated to whiteness. The mantle gas-burner is on the Bunsen principle—*i.e.*, the gas is mixed with atmospheric air so as to make the combustion as nearly complete as possible, and consequently the heat is the maximum obtainable, and no unburnt particles of carbon or other matter escape unconsumed to foul the air.

Since the heating property of gas has become so important, many gas companies have taken to adding to the gas a proportion of "water-gas," which is made by passing steam through incandescent coke or anthracite coal. Water-gas consists largely of carbon monoxide, which has considerable heating value but is very poisonous. This has rendered gas leakages much more serious in their effects.

Electric Lighting may be by arc lamps, in which the current passes between carbon rods, which are open to the air and are automatically approximated as they are consumed; or by hermetically sealed bulbs containing a filament rendered incandescent by the passage of the electric current. If the filament is made of carbon, there must be a vacuum in the bulb; if it is metallic, the bulb may contain either a vacuum or nitrogen gas. The latter, the so-called half-watt lamp, gives the greatest amount of illumination for the amount of current consumed. It should be noted that a lamp filament is less brittle when hot, and the current should therefore be switched on while the lamps or their shades are being dusted.

IV. Hygiene of the Sick-room.

Ventilation.—In attempting to ventilate a sick-room, a nurse frequently has to contend with the prejudice of its occupant against anything in the nature of fresh air. This must be overcome by carefully guarding against a draught,

otherwise the patient will begin to talk about taking a chill, and insist on having every aperture by which fresh air can enter closed up.

Ventilation must not be attempted by leaving the door of the room open, since that will only admit air that has already been used in other parts of the house, whereas what the patient wants is the purest air that can be obtained. Unless the weather is very cold, or there is much noise outside, the window must be kept slightly opened from the top, the patient, when necessary, being shielded from a draught by screens. In summer it can be opened top and bottom. In very cold weather fresh air can be introduced by Bird's method.

When possible, the patient should be covered up, and the windows thrown widely open two or three times a day, so as to ensure a thorough changing of the atmosphere. This is especially necessary after the bowels have been opened. To rest satisfied with the concealing of a bad smell by means of perfumes is a great mistake, and one that may be productive of much harm.

Temperature.—In a *hospital ward* the temperature must be kept as nearly as possible at 60° F., without regard to individual cases that might be benefited by more warmth. The temperature of the whole ward cannot be altered to suit them. In *private work* it is otherwise. The nurse has now only one patient to think about, and she can therefore regulate the temperature of the room according to his needs; for there is no doubt that babies, old people, cases of measles, and those suffering from bronchitis, require more warmth than other patients. For them a temperature of 65° is more suitable than one of 60°; at the same time, extra care must be taken in guarding them against draughts. While using these precautions, the nurse must not forget the importance of efficient ventilation. Generally speaking, however, the temperature of the private sick-room, while the patient is in bed, need not be quite so high as that of a hospital ward. Except for special cases, 55° is quite warm enough.

V. Water.

Sources.—All water is derived from the rainfall. From land and sea it rises as invisible vapour, and descends as rain, dew, and snow. Part is again evaporated, while part sinks into the earth until it reaches an impermeable stratum, where it forms the ground water and flows beneath the surface towards the nearest river, or finds its way through the soil as a spring.

1. *Rain Water* in country districts is a very good water, provided it is received on a clean surface. Being soft, it is excellent for washing and cooking, but the supply is uncertain. In most towns the atmosphere and roofs are so contaminated that rain water is not fit for drinking, although useful for washing purposes.

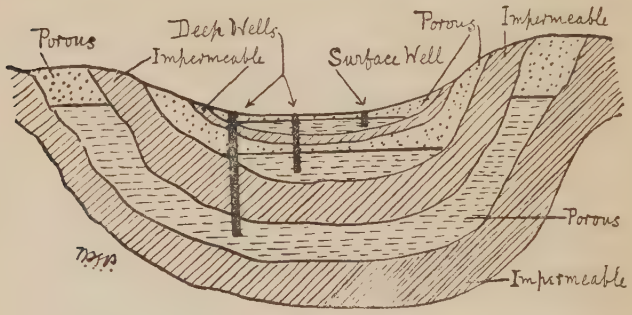
2. *Lakes* yield a very pure supply. Glasgow obtains water from Loch Katrine, Manchester from Thirlmere, and Liverpool from Lake Vyrnwy.

3. *Springs and Rivers.*—Rain, penetrating the ground, percolates downwards until it is arrested by a bed of clay or hard rock, and there becomes stored underground in the sand or chalk until it rises to such a level that it can appear at the surface as a spring. In passing through the soil it takes up organic matter. River water usually contains suspended matter in addition, and is passed through filter-beds of gravel and sand to purify it. London obtains the bulk of its water from rivers.

4. *Wells* may be either shallow or deep. Shallow wells draw their supply from the subsoil water, while deep wells tap the water-bearing strata beneath the impervious stratum. Deep-well water is generally pure. Shallow wells are often dangerous, owing to the liability to pollution from surface washings, or from drains or cesspools. They should be sunk as deep as possible, and lined with brick and cement, which should be carried above the ground level.

If water is stored in a cistern, this should be made of galvanised iron or slate, covered, and regularly cleaned. The supply for the closet should be from a separate cistern.

Standard of Purity for Domestic Use.—Good drinking water is clear and sparkling, and free from odour and taste. When allowed to stand it should show no deposit. It must not dissolve lead, otherwise if distributed in lead pipes it will produce lead-poisoning. It should not be so soft as to be unpalatable, or so hard as to render it useless for washing purposes. Chemical analysis should show it to be almost entirely free from organic matter, either vegetable or animal in origin, while bacteriological examination should prove an absence of disease-producing microbes and of those characteristic of sewage.



Diagrammatic section across a Valley, showing wells tapping the water in the permeable strata.

Hard and Soft Water.—Chalk and limestone yield good water, but it is hard owing to the presence of dissolved chalk in the former case, and sulphates of lime and magnesium in the latter. A water is hard when it does not easily produce a lather with soap. This is due to the salts of lime and magnesium combining with the soap and using it up. Much of the total hardness may be removed either by boiling or by the addition of lime-water. By either of these processes the carbonic acid, which is dissolved in the water and which holds the *carbonates* of lime and magnesium in solution, is removed, and these salts thereby precipitated. This part is called "temporary" hardness.

The remaining, or "permanent," hardness is due to *sulphates* of lime and magnesium, and cannot be removed. Soft water is much more useful for cooking and washing than hard water.

Impurities.—As above said, surface and subsoil waters, which are a common source of supply in country districts, should always be regarded with suspicion, unless taken from places far removed from possible pollution with sewage.

Apart from impurities resulting from the nature of its source, water may be polluted in distribution, for, if the pipes are broken or have open joints, sewage which has escaped from a neighbouring drain, or washings from cultivated lands or manufactories, may be sucked in and poison it. Peaty water dissolves lead pipes to some extent.

Impure Water and Disease.—If sewage containing the germs of enteric fever or cholera finds its way into a water-supply, most serious outbreaks of these diseases occur. Hundreds of cases have resulted from the excreta of a single patient passing into a stream, which subsequently joined a river supplying a town with water.

Impure water can also cause diarrhœa. In tropical countries it is a common cause of dysentery and various parasitic diseases. Goitre is sometimes associated with the drinking of a particular water. Lead-poisoning may result from drinking peaty water if lead pipes are used for conveying it.

Prevention of Water-borne Disease.—Public supplies, unless derived from a safe source, such as a deep well, require purification. Three methods are available: (1) prolonged storage, which, as experience shows, results in the disappearance of the majority of harmful microbes in a few weeks; (2) filtration through sand and gravel in so-called filter-beds; (3) chemical methods—*e.g.*, the addition of a minute quantity of bleaching-powder or of lime; the latter both purifies and softens the water.

In *domestic purification* water may be freed from living germs by boiling, or it may be passed through a germ-filter, turbid water being first filtered through sand. Among

the best known germ-filters are the Pasteur-Chamberland, in which the tube is made of unglazed porcelain, and the Berkefeld, in which it is composed of infusorial clay. These filters require cleaning every week, the tube being removed, cleaned, placed in cold water, and brought to the boil. Other domestic filters are of doubtful utility and may be dangerous.

VI. Disposal of Refuse and Excreta.

House Refuse in towns is removed by the Local Authority, and is usually burnt in a destructor or buried. Ashes should be riddled in order that the cinders may be saved for fuel. Local Authorities often insist that the animal and vegetable refuse shall be burnt in the kitchen fire. The old-fashioned brick ashpit is insanitary, and galvanised iron refuse-bins provided with a cover are now usually insisted upon. It is important that the bin should be kept covered at all times, not only to prevent nuisance but also to exclude flies. Many hospitals, particularly those for infectious diseases, possess a destructor, in which also the soiled surgical dressings are consumed.

Human Excreta.—There are two main methods of disposal of human excreta (fæces and urine), viz., the dry and the water-carriage systems. In the former, middens, privies, pail-closets, or earth closets are used, the excreta deposited therein being removed only at intervals. In the latter, water-closets are used, the excreta being flushed by means of water into a drain, and thus carried away at once from the home.

A. The Dry or Conservancy System.—The use of *middens* in which the excreta are deposited in the same pit or fixed receptacle as the garbage, ashes, and other house refuse is unsatisfactory, and is only found where sanitation is neglected. *Privies*, or pits in the ground, are also unsatisfactory, as they lead to pollution of the soil, and are always more or less offensive. *Pail-closets* are more sanitary, because they are movable, and have to be emptied

frequently owing to their smaller capacity. The best form is the *earth-closet*, which is merely a pail-closet the contents of which are kept covered with clean earth or ashes, added either by hand or automatically from a hopper each time the closet is used.

Privies, pail-closets, and earth-closets should be constructed so as to be as fly-proof as possible. When emptied, their contents, unless removed by the council in night-soil carts, should be buried at once in the ground. In some towns the filled pails are removed for emptying and cleansing by the council at regular intervals, clean pails being left in their stead.

B. The Water-carriage System.—Water-closets in general use are the valve closet, the wash-out closet, and the wash-down closet, the last being now by far the most usual. Certain other closets—*e.g.*, the pan-closet and the long hopper — formerly in use were highly objectionable, as they rapidly got foul. The wash-out closet is much inferior to the wash-down one, as the flush is broken by the shape of the pan and is therefore not so effective. The pan should be kept clean by the frequent use of a closet-pan brush.

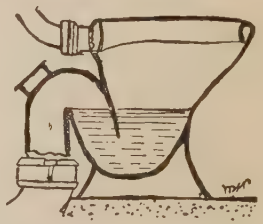
The contents of a water-closet are conveyed by a lead or iron *soil-pipe* directly through the house-wall to the outside. To prevent gas entering the house from the soil-pipe, either the terminal portion of the closet-basin or the pipe is bent into the form of an S, so that water is retained in it, the bend thus forming a *trap*. To prevent the trap becoming unsealed by a rush of water emptying it by syphon action (which is especially likely to occur when, as in most hospitals, two or more water-closets discharge into the same soil-pipe), an *anti-syphon vent* is placed in the top of each trap, opening into a *ventilating pipe* connected with the soil-pipe above the highest closet. The soil-pipe is carried above the eaves to secure free ventilation of the house-drain. The nurse may with advantage study the arrangement of pipes outside one of the hospital blocks.

The *house-drain* is made of earthenware or iron, and should be laid in a straight line and with a fall. It receives ordinarily not only the discharge from the water-closets, but also rain-water and waste-water from baths and sinks, and discharges into a sewer or a cesspool. Between the house and its junction with the sewer or cesspool, it should be trapped; and on the house side of this trap an *inlet ventilator* should be provided a few feet above the ground. Where two or more drains converge to the same point, as frequently happens in a hospital, a disconnecting manhole, or *inspection chamber,* is inserted, as also at every change in direction of the drain.

Sewers are the trunk canals into which the house-drains



Wash-out Closet.



Wash-down Closet, with anti-syphon vent in top of trap.

empty. They are smooth and usually egg-shaped in section, as this shape secures a maximum flushing effect with the minimum quantity of water. They are ventilated by gratings in the surface of the road above, or preferably by tall iron shafts permitting the escape of gases at a level above the roofs of houses.

Where there are no sewers, a *cesspool* at a safe distance from the house and well has to be provided to receive the drainage. The walls should be of bricks, cemented inside to render them impervious; pollution of the ground by leakage is thus avoided. Cesspools should be emptied when necessary by pumping, the contents being disposed of on the garden, or in towns removed in suitable carts.

Slop-water comprises the water from kitchen sinks,

baths, lavatory basins, &c. The waste-pipes from kitchen *sinks and baths* should be kept clean and well flushed, otherwise they smell offensively; hot water containing soda should be poured down each sink and bath waste-pipe at least once a week. These "wastes" should never be connected directly with the soil-pipe, lest foul gases from the drains come up them into the house; instead they should discharge in the open air over a channel leading to a trapped gully connected with a drain. A *slop-sink*, being practically a W.C., should be provided with a flushing cistern and connected with a soil-pipe; its waste, moreover, should always be provided with a trap just as a W.C. is, to prevent foul air from the drain coming up into the building.

Disposal of Sewage.—As will have been seen, sewage —*i.e.*, the liquid flowing in sewers—is made up of human excreta, waste waters from houses, stables, factories, &c., and the rain-water from street gullies and guttering of houses. Its disposal is often a difficult matter. Most sea-side resorts discharge it untreated into the sea some distance from the towns. In inland towns, it must be purified. There are two main methods of purification :—

(*a*) *The Chemical Method—i.e.*, the addition of lime and other chemicals to the sewage collected in tanks, whereby the solids are made to settle as a deposit.

(*b*) *The Biological Method—i.e.*, the utilisation of the power of certain microbes to purify sewage. These microbes are always present in the soil, and it is by their action that nature gets rid of dead bodies, excreta, and other putrefying material when buried in the earth. To utilise these microbes for the purification of sewage, the latter either is distributed over land on which vegetables, rye-grass, or osiers are grown (sewage farm), or is sprayed on to large beds of coke. During its passage through the coke it is acted on by the purifying microbes, which quickly collect in the beds..

General.—Great care should be taken to prevent the drains from becoming choked. Obstruction is usually due

to tow, cotton-wool, hair, matches, and similar articles, which should never be thrown into closets or slop-sinks.

VII. Personal Hygiene.

1. **Habits** may be aids to health, or, on the other hand, causes of disease. With regard to *eating*, quick eaters often suffer from indigestion later in life; condiments in excess are harmful, and elderly persons should eat sparingly. *Alcohol* interferes with the liver and the kidneys, and disease and early death are common results of excess. *Smoking* should not be indulged in until growth is complete. In older people, if used in moderation, it has a soothing influence, but in excess has an evil effect on the heart.

Sleep, regular and sufficient, is essential. Adults should sleep at least seven hours a day, and children much more. Abundant fresh air is wanted at night; children should not sleep with the head covered up, neither should they lie in draughts and cold currents of air, for the body needs to be kept warm at night to avoid chills.

The regular *removal of waste substances* by intestines, lungs, skin, and kidneys is essential. With regard to the bowels, the formation of a regular habit early in life is most important, while exercise also helps the action of the intestinal canal. The action of the lungs and skin is regulated chiefly by exercise and cleanliness The *teeth* should be cleaned twice a day, and examined by a dentist once or twice a year.

2. **Exercise and Recreation.**—Exercise is necessary for health, otherwise the muscles will get flabby, the circulation feeble, and the body fat, while poisonous materials will accumulate in the system. Those who in their daily work use the brain must exercise the body, and those who live by muscular exertion must exercise the mind. The brain-worker should take regular outdoor exercise, while the mechanic should take up reading, music, and the like in his spare time. Women may indulge in

walking, cycling, rowing, swimming, golf, hockey, and lawn tennis.

3. **Rest.**—Regular rest is necessary for the body, in order that the fatigued muscular and nervous systems may be repaired. This repair occurs particularly during sleep, of which a sufficient amount should be taken. In it all the functions are at a minimum, with just sufficient circulation and respiration to maintain life. The bedroom should be well-ventilated, and no heavy meal should be taken before going to bed. Cold feet should be remedied by bed-socks or a hot-water bottle.

4. **Cleanliness.**—*Soap* is used to remove dust or grease. It is either a potassium or a sodium salt of one of the fatty acids (stearic, oleic, palmitic), produced by the action of either potash or soda on fats. Soft soap is a potash soap; hard soap is a soda one.

Washing and Bathing.—If the skin is not kept clean, scales collect upon the surface, and, with dirt, block up its glands. If the skin does not do its work properly, more has to be done by the lungs and kidneys.

Baths.—Cold baths are those in which a healthy person feels cold; their temperature varies from 32° to 60° F. If the bath is only moderately long, the body heat remains constant because the production of heat balances the loss. A short bath is normally followed by a sense of wellbeing and by a feeling of warmth due to a dilatation of the vessels of the skin after their original contraction.

Baths between 60° and 88° F. are called "fresh" in the lower and "tepid" in the higher degrees. "Warm" baths are those in which one feels neither hot nor cold, the temperature ranging between 88° and 99° F. In a hot bath the temperature varies from 100° to 110° F. Varieties of the hot bath are vapour and Turkish baths. Gradually cooling a hot bath until it is nearly cold is invigorating, and prevents chills. Very hot baths, if used, should be taken at night to avoid chills. It is not wise to bathe either fasting or immediately after a full meal, or when exhausted by fatigue.

5. **Clothing** is intended to afford warmth, and protection from cold, rain, and injury. The chief materials used are wool, fur, leather, and silk from the animal world; and cotton, flax, and indiarubber from the vegetable world.

(*a*) *Wool* is the best material for underclothing: it conducts heat badly, and while very absorbent of moisture gives it off slowly, so that far less cooling is produced by evaporation from the woollen garment than from any other. It is used for the making of flannel, cloths, blankets, worsteds, and knitted goods. It has the drawback of shrinking and hardening on washing.

(*b*) *Silk* is spun by the caterpillar stage of certain moths. While being made into fabrics it is much altered by being weighted and dyed by various reagents, such as salts of tin and iron. It absorbs moisture readily.

(*c*) *Cotton* is the downy hair of the seeds of cotton plants, grown largely in India and America. The fibres, about $\frac{1}{2}$ to 1 in. long, are spun into a yarn which is then woven into fabric. It is made up into sheeting, calico, towelling, jean, flannelette, and paper. When mixed with wool, it forms merino. Cotton is very durable, and does not shrink in washing, but it absorbs moisture badly and rapidly conducts heat away. It should therefore not be worn next the skin, as, if perspiration be present, it becomes wet and readily induces chill. Cellular cotton has larger interspaces which, being filled with air (a bad conductor of heat), make the material somewhat warmer. Flannelette is highly inflammable.

(*d*) *Flax* is the fibre from a plant grown in Russia and Ireland, called a linum, from the seeds of which linseed meal for poultices is prepared. The stalks, after rotting on the ground in the damp, are beaten and combed, and so the fibre is obtained. Flax is much dearer than cotton, and is used principally in the manufacture of linen. It is, like cotton, a good conductor of heat and a bad absorbent of moisture, but the fibre and fabric are considerably stronger.

(*e*) *Indiarubber* is derived from the juice of plants grow-

ing in Africa, Asia, and South America. It is destroyed by fats, hence ointments must not be allowed to come in contact with it. Macintosh cloth is a cotton or silk fabric covered with a solution of indiarubber. Rubber can be hardened, or vulcanised, by steeping in melted sulphur at 140° C.

The warmth of clothing depends upon its material, its texture, number of layers, and its colour. Wool and fur are the warmest, then silk and cotton, while linen is the coolest. The heat-conducting property depends largely on how little air the material contains. With regard to colour, white absorbs heat the least and is consequently the coolest; while black absorbs heat the most. Coloured clothing should not be worn next the skin, as sometimes the dyes give rise to skin diseases.

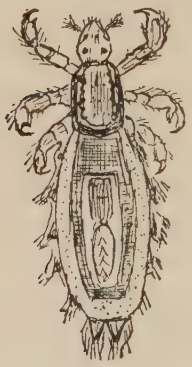
Clothing must be light, warm, porous, and absorbent; it must not constrict any part, or cause impediment in walking. Especially the ribs must not be compressed and the viscera displaced by corsets. Wool should be worn next the skin, or, if this be too irritating, a thin cotton material may be worn underneath. Stockings should not be held up by garters.

Boots and Shoes.—Speaking generally, boots are preferable to shoes, although the latter have the advantage that they allow of better ventilation of the feet. The soles should be stout and well-arched. Women should avoid flat heels; a heel of from $1\frac{1}{4}$ to $1\frac{1}{2}$ in. in height is neither too low nor too high; rubber heels and tips are allowable. The boot should not be too pointed; and, especially, should not be too short. Allowing children to continue to wear boots which they have outgrown is a fertile cause of foot-trouble in adult life, particularly bunions and rigid great-toe joints. The inner border of the natural foot is straight, and the boot should correspond. The widest part of the boot should be at the widest part of the foot—viz., at the base of the toes.

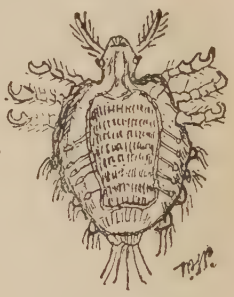
Care of the Feet.—Standing is more harmful than walking. In both the feet should be kept parallel, the common

habit of turning the toes out being bad. If there is a tendency to flat feet, the weight in standing should be thrown on the outer border of the feet to save the arch. Should definite signs of flat feet appear, the inner border of the heel and sole should be made $\frac{1}{4}$ in. thicker than the outer, or arch supports may be worn. Both these methods are palliative only, and cure depends on relief from the strain, and the adoption of a proper way of walking and standing.

If there is much perspiration of the feet, especially if accompanied by mal-odour, the interior of the boots should be dusted with boric powder.



Head Louse.



Crab Louse.

6. **Parasites.**—Living organisms, both animal and vegetable, which are dependent upon the human body, are spoken of as parasites.

(1) *Animal Parasites.* (*a*) Those *attacking the skin* are fleas, bugs, lice, acari, and mosquitoes.

Of the *Pediculus,* or louse, there are three different species, which attack respectively the head, the body, and the pubic region. The first, the *head louse,* is common in children, attacking the scalp where it can be seen crawling among the hairs; its eggs, or "nits," are fixed on the hairs themselves. The white nits so often seen on a hair at a

distance from the scalp are empty egg-shells. The treatment is described on p. 76. The second, the *body louse*, occurs generally in unclean elderly persons, giving rise to itching, especially about the shoulders ; the pediculi are found in the clothing, chiefly on the inner aspect of the shirt-collar. The clothing should be baked, and all underclothing ironed along the seams ; stavesacre ointment may be applied to the skin. The third, or *crab louse*, is found in the pubic hair, and occasionally on the eyelashes ; it is more square in shape than the other varieties, and may be readily killed by a free application of white precipitate ointment.

The *Acarus*, or itch, is dealt with on p. 298.

The *Mosquito* is of special interest in malarial countries, for one variety transmits the plasmodium of malaria (see p. 241). In these districts every endeavour is made to eradicate them by removing any stagnant water which may form a breeding-place, paraffin being poured on pools which it is impossible to drain away.

(*b*) Those *attacking the internal parts* are the intestinal worms, the tapeworm, roundworm, and threadworm (p. 375) ; and less commonly the echinococcus (the bladder form of the tapeworm of the dog), which causes hydatid cysts in man, affecting especially the liver. There are others which cause tropical diseases.

(2) *Vegetable Parasites.*—Of these, two classes are of interest—viz., bacteria and moulds.

(*a*) *Bacteria* are very minute unicellular vegetable organisms, which multiply by fission. They are dealt with on p. 237 *et seq.*

(*b*) *Moulds* are multicellular vegetable organisms, such as those causing thrush (p. 274) and ringworm (p. 296).

VIII. Infection.

Infection, its sources, and modes of transmission, with methods of disinfection, are described in Chapter XXII.

IX. General.

Every one should be his own health officer, watching carefully the manner in which he lives, and allowing no small malady to be untreated and so grow into a serious disease. As Sir George Newman has said, it is not easy to overestimate the harvest of sickness and death directly resulting from neglect of such minor ailments as colds, measles, dental caries, oral sepsis, discharging ears, habitual constipation, and dyspepsia.

Causes of Death.—Some details, interesting to all concerned with the sick, may be quoted from the annual report of the Medical Officer of the Ministry of Health for 1922. Infant mortality had fallen considerably, but measles had killed 5694 during the year, influenza 21,498, and cancer 46,903. Of each 1000 deaths, diseases of the respiratory system accounted for 181; those of the circulatory system, 157; those of the nervous system, 101; cancer, 96; tuberculosis, 88; and diseases of the digestive system, 52. Of these "killing diseases," cancer is the only one that is definitely increasing, especially among men; now one out of every ten persons dies of cancer. Tuberculosis is steadily decreasing.

Sequelæ of Infectious Diseases.—Apart from the mortality directly resulting from infectious diseases, after-effects leading to permanent impairment of health are apt to occur. Thus, tuberculosis may follow whooping-cough and influenza; middle-ear disease is not infrequently a result of scarlet fever and measles; smallpox may cause blindness; cerebro-spinal fever may give rise to incurable deafness and mental disease; and scarlet fever may also produce chronic disease of heart or kidney. The sequelæ of syphilis and gonorrhœa are often even more serious (see Chapter XXVII.), and these diseases help largely towards filling our hospitals, asylums, and homes for defectives.

CHAPTER III.

DIETETICS AND COOKING.

In connection with dietetics, the processes of *digestion* and *absorption* should be studied in a text-book of Physiology.

I. Constituents of Food.

Food is required to furnish material for growth and for the renewal of the tissues, to maintain the body heat, and to produce energy for work, both physical and mental.

The **Elements of Food** are five in number: proteins (abundant in lean meat, eggs, milk, and cheese), carbohydrates (*e.g.*, potato-starch and sugar), fats (*e.g.*, meat fat, butter, cream), mineral salts, and water. The *protein*, or nitrogenous element of the food, serves as a stimulus to growth, and it is essential to life since it alone can replace the continuous protein waste of the cells of the body. *Fat* is chiefly of value for the maintenance of the body temperature. *Carbohydrates* are a source of muscular energy and heat; they may be partly converted into fats and thus increase the body-weight. *Albuminoids*—*e.g.*, gelatin—can take no share in tissue formation, but they can supply energy and so save protein from being wasted in doing so.

Vitamins.—It is not sufficient, however, to supply fat, carbohydrate, protein, and salts. Experiments have shown that animals cannot be reared on these substances if chem-

ically pure. This has led to a knowledge of substances named *vitamins*, which are essential for growth and for the prevention of the "deficiency diseases"—viz., rickets, beriberi, and scurvy. Vitamins A and D occur especially in animal fats and green leaves, Vitamin B in the germ of seeds, and Vitamin C in vegetables and fruits (see p. 328). In ordinary normal diet these are all present, different foodstuffs having varying amounts of them.

II. Common Articles of Diet.

1. **Milk** consists of minute globules of fat suspended in water containing proteins (lactalbumin and casein), carbohydrates (lactose or milk sugar), and salts in solution. On standing, a large proportion of the *fat* rises to the top as cream. The *lactalbumin* is coagulated by heat, and helps to form the skin on milk boiled in an open saucepan. *Casein* forms a curd with rennin, the curdling ferment of the gastric juice.

A precisely similar coagulation occurs in the making of a *junket*. When rennet, derived from the lining membrane of the stomach of the calf, is added to milk, and this is kept in a warm place, a soft jelly or *curd* is formed. Later the jelly shrivels and a yellowish fluid, *whey*, is squeezed out. The nurse should recognise that all raw milk, very shortly after it has been swallowed, is converted in the stomach into junket.

2. **Butter** is almost pure fat, and is obtained by churning pure milk or cream so that the little globules run together. When the butter is separated, *butter-milk* is left.

3. **Margarine** is an artificial butter, made largely or entirely from vegetable fats, worked up with a little milk, and artificially coloured and salted. In good quality it is little inferior in nutritive value to ordinary butter, but it has no vitamin save that introduced by any butter or beef or mutton fat used in its manufacture. In order to

make fraud difficult, no more than 10 per cent of butter-fat is permitted in margarines.

4. **Cheese** is made by adding to milk some rennet, which causes it to curdle, entangling many of the fat globules. It is thus rich in protein and fat, but occasionally proves indigestible. Dutch and some American cheeses are made from skimmed milk; Cheddar and Cheshire from whole milk; and Stilton from whole milk to which cream is added. Cream cheese is fresh curd, moderately pressed, and not allowed to ripen before being eaten.

5. **Eggs.**—Hens' eggs weigh about 2 oz. each. They are often preserved by packing in lime, or stocking in water-glass solution. A good egg will sink in a solution of 2 oz. of salt in a pint of water, while a stale or bad one will float. When held vertically against the light, fresh ones are more transparent in the centre, old ones at the top. Protein matter is largely present in the form of albumin, both in the white and the yolk; fat exists as an oil in the yolk; also carbohydrates (in minute amount), salts, and water.

6. **Fish** is, as a rule, an easily digested food, although less satisfying than meat. The less fat the fish is, the more digestible its flesh. The *fat group* of fishes includes the salmon, herring, mackerel, eel, and sprat; the *non-fatty group* the cod, whiting, plaice, sole, brill, and turbot. Crabs, lobsters, shrimps, &c., are nutritious, but indigestible. Raw oysters are digestible, but it takes fourteen to equal the nourishment of one egg. For the *preservation of fish*, drying, pickling, salting, and smoking are employed; the digestibility is thereby reduced, and preserved fish is unsuitable for the dyspeptic and the invalid.

7. **Meats.**—The flesh of animals contains a large amount of protein, fatty matters, and salts, but practically no carbohydrates. It also yields certain nitrogenous bodies, called *extractives*. It is more easily digested than most vegetable foods. Meat requires to be kept, or "hung," for several days before cooking, in order that the stiffening

(*rigor mortis*) following death may pass off, otherwise it is tough.

Beef is usually obtained from a four-year-old animal, the best parts being the rump, sirloin, fore-ribs, and buttock. Mutton is obtained from the three-year-old sheep, and is more easily digested; the best parts are the leg, saddle, loin, and shoulder. Pork is often fat, and not easy to digest. Bacon is more digestible, and is an excellent fatty food for children. The liver, kidneys, pancreas (sweetbread), and heart are useful articles of food. Bones, if broken up and boiled, are valuable in the making of soup. Game and poultry, except ducks and geese, have very little fat, and are very digestible.

The *most digestible* meats are sweetbreads, chicken, pigeon, and tripe. If red meat is ordered, a beginning may be made with grilled lamb chops or filleted steak.

8. **Vegetable Foods** form a large group, remarkable for the fact that, although it supplies a certain quantity of protein and fat, its principal function is the provision of carbohydrates, salts, and vitamins. Its most important protein is *gluten*, which is largely present in wheat-flour. The carbohydrates are in the form of starches, cellulose, and sugars; and the fats as various vegetable oils.

Raw *starch* grains are enclosed in envelopes of tough *cellulose*, and for this reason must be cooked before being eaten; boiling bursts the cellulose envelopes, and so allows the digestive juices to get at the starch proper.

The great *classes of vegetables* used for food are: (*a*) cereals (*e.g.*, wheat, barley, oats, rice); (*b*) pulses (peas, beans, lentils); (*c*) roots and tubers (potatoes, artichokes, arrowroot, sago, tapioca, carrots, parsnips, turnips, beetroot); (*d*) green vegetables, &c. (cabbage, cauliflower, marrow, tomato, lettuce, onions); and (*e*) fruits (apples, oranges, &c.).

(*a*) *Cereals*, or farinaceous foods, are very nutritious. The seeds are ground into meal and the outside woody fibre separated, but too much of the husk must not be removed, as it contains most of the vitamin and gluten.

Thus "whole meal" is more nutritious than white flour. Macaroni and vermicelli are preparations of flour. Pearl barley is the grain deprived of its husk and polished by rubbing. Oats are rich in fat, and are used chiefly as oatmeal. Rice contains a large amount of starch. Maize, after special treatment, is largely sold as oswego, cornflour, and hominy.

(*b*) *Pulses* contain so much nitrogenous matter that they can be used to replace meat to some extent.

(*c*) *Roots and tubers* contain much starch and water, but little protein.

(*d*) *Green vegetables* are not very nutritious, but supply valuable vitamins. Cauliflower is the most rapidly digested.

(*e*) *Fruits* are useful aperients. Some are sources of real nutriment. The banana, for example, contains carbohydrate and salts, and some protein.

9. **Alcoholic Beverages.**—*Beer* is a fermented saccharine solution, flavoured with hops or vegetable bitters. *Wine* is fermented grape-juice. *Brandy* is made by the distillation of fermented grape-juice; *whisky* from malted grain.

Alcoholic beverages have very different effects according to whether they are taken in dietetic doses or in excess. When associated with other substances, as in malt liquors, alcohol in moderate doses is an aid to digestion and to some slight extent a food, but its principal use is that of a stimulant. In excess it is an irritant, and in time leads to inflammation of the stomach, cirrhosis of the liver, and degeneration of the brain.

10. **Other Beverages.**—*Tea* contains tannin and a stimulant called theine. It should not stand more than three or four minutes before being poured into another vessel, otherwise the tannin extracted will make it astringent. It is an excellent restorative to the nervous system, but its abuse leads to indigestion and constipation owing to the tannin present, as well as to nervous depression and insomnia, the effects of the theine.

Coffee contains caffeine (a stimulant similar to theine)

and but little tannin. It may be made by boiling, or by infusion with nearly boiling water. It is stimulating and lessens fatigue, but if taken in excess it is apt to cause insomnia.

Cocoa is a slight stimulant, and contains fat and sugar; taken with milk it is thus a nutritious food. Pure cocoa may have too much fat and disagree.

11. **Condiments,** or flavourings, are not foods, but are used to make food palatable, improve the appetite, and stimulate the flow of the digestive juices. They are such articles as pepper, mustard, vinegar, herbs, and spices.

12. **Preserved Foods.**—Food may be preserved by sterilising at a high temperature and sealing in tins as in tinned goods; by drying in the sun, or in a current of air, or in the smoke of a wood-fire; by salting, or adding such antiseptics as boracic acid, salicylic acid, and formalin; and by keeping at a low temperature (freezing or chilling) to prevent the growth of putrefactive organisms.

The dangers attending the use of preserved meat are those depending upon the original character of the meat, together with risk of putrefaction if the process is imperfectly carried out. Preserved food is also apt to go bad when exposed to the air, and therefore no more tins should be opened than will be required at the meal. Tinned meat sometimes gives rise within a few hours to symptoms of acute gastro-intestinal irritation—viz., vomiting, purging, cramps, some degree of pyrexia, and prostration. These ill-effects may result from decomposition due to imperfections in the process of sterilisation or sealing. In this case the tin will show signs of pressure in place of the usual vacuum, the ends of the tins bulging outwards ("blown"); the contents also will usually have lost their colour, and may have an offensive smell, while the inside of the tin is often browned by the action of the acids formed.

13. **Sugars.**—There are several varieties: *cane-sugar* (the ordinary sugar of commerce); *maltose* (the final product

of the action of diastase on starch, *vide* p. 360) ; *lactose* (found only in milk) ; and *glucose* (also called grape-sugar or dextrose, existing in fruits, and made from starches by treating them with dilute acids). Glucose is the most easily digested, dextrose being the form in which sugar exists in the blood ; in a purified form (*dextrose* or "pure medicinal glucose") it is used for intravenous and subcutaneous injections.

III. Children's Diets.

Diet of Young Children.—See Chapter XXI.

Diet of Older Children.—Growing children must have plenty of suitable food. Meals should be given at proper intervals ; eating between meals, except a light lunch, should be discouraged. The child should be made to masticate his food well and eat slowly. If he will not take proper food he should be allowed to go hungry. Water should be given freely in the intervals, but only a little allowed during the meals, as the tendency is to use it to wash the food down without proper mastication.

Farinaceous foods form an important part of the diet ; if oatmeal porridge suits, it is very nourishing ; cornflour, arrowroot, sago, and rice are valuable provided the diet includes plenty of protein and fatty foods. Sugar also is an important food, but should be given only with food or just after meals. Animal food is best given to young children in the form of eggs, fish, and white meat. Butcher's meat should be used sparingly. Salted meat, smoked fish, and pickles are bad ; and fried food, except bacon fat and fish, should be avoided. The fat of meat and butter should be given liberally. Fruit and fresh vegetables are wholesome, as also is jam. Cocoa and milk are good, but tea and coffee should not be given under the age of ten, unless largely diluted with milk.

IV. Methods of Cooking.

Cooking is required by practically all food, except milk, eggs, oysters, some vegetables, and fruit, before it is fit for consumption. By cooking parasites are destroyed; the food is partially broken up, and thus more readily acted on by the digestive juices; while agreeable flavours are produced which stimulate the appetite and the digestion.

There are eight different methods of cooking: boiling, soup-making, steaming, stewing, baking or roasting, grilling, frying, and braising.

1. **Boiling.**—As it is desired to keep the nutritious material in the joint, the latter must be "sealed"—*i.e.*, placed in *boiling* water for five minutes to coagulate the albumin on the outside. The process is then finished by simmering at a temperature of about 170° F. by drawing the pan a little away from the fire; otherwise the meat will become hard and indigestible. The time allowed for meat is 20 minutes per lb. and 20 minutes over; and for fish, 7 minutes per lb. and 7 minutes over. This is only a rough guide, thick pieces requiring longer than thin ones.

2. **Soup-making.**—In soup-making, on the other hand, the object is to get all the nutriment possible out of the food into the liquid. The meat should be finely shredded, and freed from all fat; it should be put in *cold* water, and the temperature gradually raised to 170° F.; it should never be allowed to boil. There should be 1 lb. of meat to 1 pint of water and $\frac{1}{4}$ teaspoonful of salt; all fat should be skimmed off with kitchen paper before serving.

3. **Steaming** is the best way of cooking for invalids, for the nutriment is kept in the food, the moist heat helps to render it digestible, and small pieces can be quickly cooked. Wipe the meat or fish with a damp cloth; place the steamer over boiling water, and keep it covered. This

method should be used for potatoes and greens instead of boiling, which wastes so much nutritious matter.

4. **Stewing** is an economical method, for even the coarse parts of the meat can be used, and the meat, being well broken up, is readily digested. Cut the material (meat or fish or vegetables) into small pieces ; add a liquid (stock, water, or milk) and condiments ; and then cook very slowly until tender. If the vegetables are fried before the meat and stock are put in the pan, the stew is more savoury.

5. **Baking** or **Roasting** retains the nutriment, at the same time developing an agreeable flavour and taste. Foods cooked in this way, however, are not so digestible as those cooked by boiling, steaming, or grilling. The joint must be "sealed" by exposing to a high temperature in a hot oven for 3 to 7 minutes, the heat being then reduced for the remainder of the time. The time allowed is 15 minutes per lb. for meat and 15 minutes over. The joint should be frequently basted.

6. **Grilling** is suitable for small pieces of meat, fish, chicken, &c. ; it is quick, and the meat is digestible. The grill should be heated before the meat is placed on it, and the meat should be "sealed" by fierce heat for the first minute or two. It should not be over-cooked. It should be turned with a knife, not with a fork ; a fork should never be stuck into a sealed joint, otherwise the juices will escape.

7. **Frying** may be done by the dry or the wet method. The *dry* method is not so good for an invalid, as the fat, being in small quantity, cannot be raised to such a high temperature and is therefore liable to soak into the food. After cooking the food should be well drained on kitchen paper. The *wet*, or *deep*, method, may be used for small pieces of fish, previously cooked meat, &c. The fat should be heated until it ceases to bubble and a blue smoke rises before the food is put in, and enough should be used to cover it. Afterwards the food should be well drained The fat can be used again.

8. **Braising** is really cooking in the steam from stock on a bed of vegetables, with a charcoal fire on the lid of the braising-pan to brown the meat at the same time. In England, however, it is usual to dispense with the fire on the lid, and place the meat, after it is cooked, in a very hot oven for a few minutes.

For braising, carrots, turnips, onions, and a little celery are all cut up in large pieces, and placed on the bottom of a stewpan or braising-pan, a bunch of herbs is placed in the middle, and about ½ pint of stock put in. The meat is then cooked, resting on the heap of vegetables, which should be large enough to prevent the meat from touching the stock, the pan being placed over a gentle heat, with the lid lightly on, and allowed to simmer gently.

V. Sick-room Recipes.

1. **Milk Preparations.**—(*a*) *Whey.*—Add a tablespoonful essence of rennet to a quart fresh, not boiled, milk, whole or separated, and keep it at 90° F. for ½-1 hour, until a curd is formed. When firm, break the curd up with a fork, and strain the whey off through muslin. It contains lactalbumin, lactose, and salts; if whole milk, a little fat also. *White Wine Whey.*—Add 4 oz. common sherry to 1 pint hot milk, and strain after standing.

(*b*) *Junket* requires one quart of fresh milk, a little water, a tablespoonful of essence of rennet or 1 Hansen's junket-tablet, 1 oz. sugar, and grated nutmeg or 1 tablespoonful vanilla. Dissolve the tablet in the water, make the milk lukewarm (80°-90° F.), add the sugar and flavouring, and stir in the dissolved tablet quickly. Pour at once into a deep glass dish, grate nutmeg on the top, and leave in a warm room for half an hour until firm. Then put in a cool place.

(*c*) *Milk Jelly* requires 1 pint milk, ½ oz. gelatine, 1 oz. sugar, and the rind of one lemon or two bay-leaves. Place all in a saucepan over a gentle heat, stir until the gelatine is dissolved, strain into a basin, and leave until about to

set ; then pour at once into the mould. A little cochineal may be added to colour the jelly.

(*d*) *Peptonised Milk* is made by diluting the milk with one-fourth part of water, adding a tube of Fairchild's peptonising powder, and allowing to stand for 20 to 30 minutes at 100°-105° F. It is then brought to the boil or kept on ice, to prevent further digestion ; otherwise it becomes bitter.

(*e*) *Benger's Food.*—Mix 1 tablespoonful Benger's Food and 4 tablespoonfuls cold water together in a basin to a smooth cream by means of a spoon. To this cold mixture add slowly, whilst stirring, ½ pint of milk which is just off the boil. Now set aside the basin away from heat for 15 minutes to allow the food to digest. Then return to a clean saucepan, and heat to the boil whilst stirring. A shorter digestion yields a less sweet, and a longer digestion a sweeter food.

(*f*) *Gruel.*—Make a smooth paste of 1 tablespoonful Robinson's Patent Groats and a wineglassful of cold water, gradually added. Pour this into a stewpan containing 1 pint boiling milk ; stir while boiling for 10 minutes ; then pour into a basin and add a pinch of salt and a little butter, or, if more agreeable, some sugar and a small quantity of spirits. Water gruel is made in the same way by substituting water for milk.

(*g*) *Arrowroot.*—Make a dessertspoonful of arrowroot into a paste with a little milk, pour ½ pint of boiling milk on to it, and boil slowly for 5 minutes, stirring quickly. If desired, it may be flavoured with lemon essence or sherry.

2. **Egg Preparations.**—(*a*) *Albumin Water.*—Separate the white of a new-laid egg and beat it thoroughly ; add ¼ pint water, beat and strain. Infants should have ½ pint water to the white of an egg.

(*b*) *Egg Flip.*—Beat an egg up thoroughly ; add 1 or 2 oz. milk, stir well, and strain through a wire sieve ; add ½ oz. brandy or sherry very gradually, stirring all the time.

(*c*) A *Custard* requires a well-beaten egg, ½ pint milk,

two lumps of sugar, and flavouring (a bit of cinnamon or fresh lemon peel). Mix, beating all the time.

If it is to be *baked*, place the pie-dish in a pan of water in a rather slow oven till it sets.

If it is to be a *boiled* custard, put it in a jug in a saucepan of boiling water, or in a double saucepan, and heat, stirring until it thickens. Serve in small glasses.

(*d*) An *Omelette* requires two eggs, 1 dessertspoonful water, ½ oz. butter, pepper, and salt. Whisk the eggs, water, pepper, and salt together in a basin. Melt the butter in a frying or omelette pan, and when the fat is beginning to get hot, pour in the egg mixture. Stir a little for a few seconds till it is just beginning to set, then allow to cook for another second or two, and while still quite soft and moist in the middle, fold over in halves and turn out in a hot dish. Serve at once.

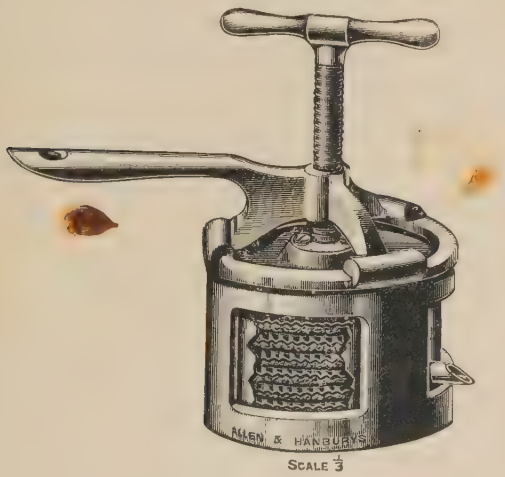
(*e*) *Poached Egg*.—Boil some water in a small saucepan, add a large pinch of salt; break the egg into a cup, keeping the yolk whole. When the water boils, tilt the saucepan and gently slip the egg into it; with a tablespoon fold the white over the yolk, so as to produce a plump appearance, and simmer until the white is set. Lift with a tablespoon, and drain. Serve on buttered toast.

(*f*) *Scrambled Egg*.—There are required 2 eggs, 1 dessertspoonful milk, salt and pepper, ¼ oz. butter, and toast. Beat up the eggs, add the seasoning and milk. Melt the butter in a small saucepan, pour in the eggs, and stir over a moderate fire till a soft paste is formed. Pile on the rounds of toast, sprinkle with chopped parsley, if liked, and serve at once.

3. **Meat Preparations.**—(*a*) *Beef Tea* requires ½ lb. beef (topside or stewing steak), ½ pint cold water, and salt. Remove all skin, gristle, and fat (it should weigh ½ lb. without these), and cut up finely; put the meat into the water in a jar with a large pinch of salt, and tie down with buttered paper; then stand the jar in a saucepan of boiling water, and allow the latter to boil gently for two or three hours, stirring the beef up occasionally;

strain, and remove any fat with paper. Season to taste. Beef-tea contains little nourishment ; it is, however, most useful for its stimulating properties, as well as for the salts it contains.

(*b*) *Mutton Broth.*—Take 1½ lb. scrag end of neck of mutton ; cut up fine and chop bones into pieces. Place in saucepan with 1 pint cold water, ½ onion, ¼ teaspoonful salt, and a little parsley ; bring slowly to the boil, removing scum. Allow it to simmer for four hours with the lid



The "Hercules" Meat Press.

on ; then strain through a hair sieve. Remove fat when cold. If desired, a dessertspoonful of well-washed pearl barley may be added, and the broth boiled until the barley is soft.

(*c*) *Raw Meat Juice.*—Finely mince fresh rump steak, which should be quite free from fat ; add 1 oz. of cold water for every 4 oz. of meat, and let stand for half an hour ; then express the juice by means of a Hercules Meat Press, or strain through muslin. Meat-juice does not keep well, and should be made twice a day. Meat that is

dry should be scraped instead of minced, and the water then added.

4. **Drinks.**—(*a*) *Barley Water.*—Wash 2 oz. pearl barley thoroughly; put it in a saucepan with 1½ pints cold water, and bring to the boil; let it simmer gently for half an hour, and then strain. It should be prepared twice daily, as it does not keep well.

(*b*) *Imperial Drink.*—Take 1 drachm cream of tartar, the juice of 1 lemon, and ¼ lb. loaf sugar; mix in an earthenware jug, and add 1 pint boiling water.

(*c*) *Lemonade.*—Peel 3 lemons thinly, so as to remove only the yellow part of the rind; pare off the white, and cut the pulp into thin slices, removing the pips; put the pulp into an earthenware jug with as much of the yellow rind as is desired; add ½ lb. loaf sugar, and pour on it a quart of boiling water. More sugar or water may be added according to taste. Strain when cold into a glass jug.

VI. The Feeding of Patients.

Food should be served with strict punctuality; liquid diet every two hours and solid diet every four hours during the day. The dietary should be as varied as possible, and the patient should never know what is coming. The tray should be clean on both sides, with spotless tray-cloth and table napkin. It should not be crowded, and a few flowers will add to its appearance. Care should be taken that everything is within easy reach. The helpings should be small, and more given later if desired. Hot food must be hot and cold food cold, for lukewarm food is disliked by patients. Liquid food should be served in a feeder or a cup, with a saucer in either case; none must be spilled into the saucer. If no tray is used, a locker-cloth should be spread under the plate to prevent soiling of the bed-clothes.

In the feeding of recumbent patients, a folded towel should be arranged under the chin, and the head may be raised a few inches by placing the hand beneath the pillow.

The cup should only be partly filled lest some of the contents escape down the patient's neck. For the weak and helpless, a piece of drainage tubing may be attached to the nozzle of the feeder, or the patient may suck the fluid up through a bent glass tube. Helpless patients require their vegetables and meat cut up or minced.

A patient should not be wakened for food unless it is really necessary, but the nurse must see that he takes a sufficient quantity in the twenty-four hours. If there is difficulty, she must quietly persist. When he has had enough, what is left should be taken away at once. She should never ask a patient with a bad appetite what he will have.

For the average adult patient with pyrexia, a very common allowance is 3 pints of milk in the twenty-four hours. As he will need a drink at least every two hours, this should be divided into twelve feeds of 5 oz. Every 5 oz. of milk should have 3 oz. of barley water or lime-water added to it. Milk should never be left uncovered at the bedside. When beef tea forms part of the diet, it should be given in feeds of 5 oz. at a time. The speed with which a return to solid food is made depends upon the nature of the patient's illness, and the condition of his digestive apparatus.

VII. The Importance of Pure Milk.

Adulteration of Milk.—The chief adulterations are the addition of water and the removal of cream. The removal of cream raises the specific gravity, but by adding water this can be brought down to normal again. Preservatives (carbonate of soda, salt, formaldehyde, boracic acid) are sometimes added to preserve the milk. These are harmful to invalids and infants.

Dangers of Impure Milk.—Epidemics of typhoid and scarlet fevers and outbreaks of epidemic sore throat have resulted from contaminated milk. Tuberculosis is common among cattle, and tubercle bacilli can frequently be demon-

strated in samples of milk. It is safer to drink mixed milk from a herd than milk from one cow, as it is less likely to contain a large dose of tubercle bacilli. The sources of contamination during milking are many. Dirt drying on the cow's coat may be shed into the milk-pail unless care is taken to clean the animal before milking. Infection also may come from the hands and clothes of the milker. Stable dirt and lack of cleanliness in the dairy utensils may cause further infection, as also may the usual methods of transport and retailing. After delivery milk may be infected by being placed in an unclean vessel, or by being left uncovered and exposed to flies, or by being handled by a person suffering from an infectious disease. It may also pick up a disagreeable flavour from proximity to strong-smelling food in an ill-ventilated pantry.

Graded Milk.—An attempt has been made to encourage the supply of cleaner milk by grading it as follows :—

1. *Certified Milk* must be produced from herds which pass a tuberculin test and a veterinary examination at intervals of six months. The milk must be bottled at once on the farm, and on delivery must not contain more than 30,000 organisms per cubic centimetre, or any coliform bacilli in $\frac{1}{10}$ cubic centimetre.

2. *Grade A (Tuberculin-tested) Milk* is produced under the same conditions as certified milk, but the bottling may be done by the distributor. It may contain not more than 200,000 organisms per cubic centimetre, and no coliform organisms in $\frac{1}{100}$ cubic centimetre.

3. *Grade A Milk* is the same as the last, except that the tuberculin test is not required, though to compensate for this a veterinary examination of the herd is made every three months instead of each six months.

4. *Grade A Pasteurised Milk* has the same conditions as Grade A Milk, but is pasteurised. The bacterial restriction is the same as for certified milk.

5. *Pasteurised Milk* is milk which has been kept at 145°-150° F. for 30 minutes, and immediately cooled ; it is not

allowed to be heated more than once. The bacterial content must not exceed 100,000 organisms per cubic centimetre. There is no requirement for bottling.

Storage of Milk.—The National Clean Milk Society observes: Careless housewives often spoil milk that is delivered to them in good condition by keeping it standing in the kitchen or on the dining-table where it gets warm. If left uncovered, *flies* may settle in it, and flies carry dirt and disease. The more quickly milk is cooled and the colder it is kept, the longer it will keep, and the better and safer it will be for the children. Bacteria, which are responsible for the changes that take place in milk, increase rapidly in warm milk, but slowly at a low temperature. Stand the *milk jug*, *bottle*, or *basin* in a basin of cold water, and cover it with a plate put upside down, large enough to cover the opening completely. If the milk is in a bottle, a drinking-glass can be put over the top. Change the water frequently to keep it cool. *Vacuum flasks* may be used to keep milk cold for many hours, particularly when travelling, but they should never be used to keep milk warm. Milk absorbs *smells* rapidly; it should not be put, therefore, near onions or other foods or groceries which have an unpleasant smell, or it will taste of them. Everything which is used to hold milk must be spotlessly clean, and after being well scrubbed and washed should be scalded, then turned upside down, and left to drain and cool on a clean shelf or table before a fresh supply is put into it. This also applies to the covers. Fresh milk should never be put into a warm jug or basin, and should always be kept covered. Milk which is carried into the *sick-room* should not be used by any other member of the family, because milk is very easily infected. In the case of *infectious disease* do not take the milk bottle into the patient's room, because disease may be spread by infected bottles.

In *Wards*, milk is stored in a refrigerator or on the slate shelf of a cool larder, either in milk-pails, the lids of which should be kept closed, or in jugs covered with a plate. The cream and milk should be intimately mixed before

use; both stirrer and measure may be kept on a clean plate beside the pail. In hot weather jugs are often stood in cold water, for souring is the result of the milk not having been kept cool. Milk should not be scalded if it has been pasteurised before delivery.

VIII. Observations on Jellies, Soups, &c.

Jellies.—The basis of jellies is *gelatin*, produced by boiling the connective tissue contained, for example, in veal, which is therefore often used in the making of strong soup. Similarly, calf's feet yield a pure gelatin jelly. *Isinglass* is gelatin from the swim-bladder of fish, especially of the sturgeon. Ordinary *commercial gelatin* is obtained from hide-clippings, and is as satisfactory for making jelly or soup as gelatin obtained from the more expensive sources. Gelatin has the peculiarity that it dissolves in boiling water and sets as a jelly on cooling, even in very weak solutions. About a quarter of *calf's feet jelly* is solid matter, of which only a quarter is gelatin, the remainder being chiefly sugar on which its nutritive value mainly depends.

Soups, after skimming, contain extractives, mineral matter, and some gelatin dissolved out of the connective tissues of the meat—*i.e.*, they contain chiefly the flavouring constituents of the meat from which they have been prepared. If, then, one wants to make soup nourishing, one must simply use it as a vehicle by means of which other food materials (cornflour, barley, potato, grated cheese, macaroni, peas, lentils, purée of chicken, &c.) added to it can be conveyed to the stomach.

A **Beef Extract,** such as *Liebig's Extract*, though containing too little protein matter to be itself a food, often acts as a valuable aid to other foods, the extractives which it contains rousing the appetite and exciting the secretion of gastric juice. *Bovril* and *Oxo* contain some meat fibre in addition. *Marmite* is an extract prepared from yeast, and resembles beef extract, although it may

not have quite the same stimulating effect on gastric secretion; it is a good source of Vitamin B.

Beef Juice.—*Raw meat juice* contains about 5 per cent protein and some extractives. *Commercial beef-juices* (Valentine's, Brand's, Wyeth's, Armour's, &c.) contain more protein than the home-made juice, but not nearly enough to justify them being regarded as foods. Owing to the high proportion of extractives and salts, they can only be administered in very moderate quantity without running the risk of exciting diarrhœa and thirst.

IX. Notes on Dietetics.

As stated on p. 37, the maintenance and repair of the tissues is effected by proteins, mineral matters, and water, and by these alone. Energy for conversion into heat and work, on the other hand, can be provided, not only by protein but by albuminoids (*e.g.*, gelatin), carbohydrates, and fats. Chemical analysis tells us which of these nutritive constituents is present in any food, and in what amount.

Calorie Value.—Since the changes which food undergoes in the body are changes due to oxidation, the amount of heat which a food can yield on complete combustion may be taken as a measure of its value as a source of energy. This may be expressed in terms of calories, a *calorie* being "the amount of heat required to raise 1 litre of water 1° C." The heat value of one gramme of either protein or carbohydrate is 4 calories, and of one gramme of fat, 9 calories. Knowing this, it is easy to ascertain the total calories in a food if we know its chemical composition. Thus, cow's milk of average quality contains in 100 grammes (as is stated on p. 350) $3\frac{1}{2}$ grammes of protein, $3\frac{1}{2}$ grammes of fat, and $4\frac{1}{2}$ grammes of carbohydrate. The total calorie value of 100 grammes of milk would thus be $63\frac{1}{2}$ calories ($3\frac{1}{2}\times4$, plus $3\frac{1}{2}\times9$, plus $4\frac{1}{2}\times4$).

Digestibility.—A digestible food is one which is disposed of by the stomach with little trouble, and without

producing any feeling of discomfort or pain. The test of a food's digestibility is the time which it has to remain in the stomach before it is fit to be passed on into the intestine. The shorter the stay has to be, the greater its digestibility. One investigator arranges certain foods in order of digestibility as under :—

1. Beef-tea, milk, soft or raw eggs, Albert biscuits.
2. Boiled calf's brains, sweetbread, boiled fowl or pigeon, calf's feet.
3. Scraped underdone steak, potato purée, stale bread.
4. Roast chicken or pigeon, roast veal, cold underdone roast beef, white fish, macaroni, rice.

Absorbability.—It is not desirable that the whole of the food should be absorbable. It is preferable that it should leave a moderate amount of unabsorbed residue, to act as a stimulus to peristalsis of the intestine. On the other hand, too much residue, such as results from a purely vegetable diet, demands too much work on the part of the intestine. This has some influence on treatment. For example, in diarrhœa, in which peristalsis is exaggerated, one gives those foods which are most completely absorbed, such as rice or milk ; whereas if there is diminished peristalsis, as in constipation, one gives green vegetables and whole-meal bread.

Amount of Food required in Health.—Hutcheson says that the standard amounts of the different nutritive constituents required daily are :—

Protein .	100 grammes	($3\frac{1}{2}$ ounces)
Carbohydrates .	450 ,,	(nearly 16 ounces)
Fat . . .	75 ,,	(,, $2\frac{3}{4}$,,)

The energy value of such a diet is about 3000 net calories. Such a standard may be regarded as suitable for a *man* of average build and weight, leading an active life and doing a fair amount of muscular work. The average *woman* requires 2500 calories. *Children* of fourteen years need as much as adults. Children between ten and fourteen years

require as much as women. Between six and ten years they need 2100 calories, and under six years 1500 calories.

Of all the factors which affect the amount of food required, work and rest are by far the most potent. Thus, while a tailor requires only 2750 calories, a woodcutter needs 5500. A person resting in bed will do with 2000 calories or less. Weight and build, climate and season, also influence the amount. Persons who are muscular, or who, being tall and thin, expose a large surface to cooling influences, require proportionately more food. In summer animal foods should be more sparingly consumed, and the proportion of vegetable matter in the diet relatively increased.

Necessity for a Mixed Diet.—Some foods are too rich in protein; others contain too much carbohydrate or fat. If a mixed diet is used, the excess of a particular element in one article is played off against its deficiency in another. Hence people eat bread with cheese, beans with bacon, potatoes with beef, milk and egg with rice, &c. Again, although either fat or carbohydrate is quite capable of furnishing all the energy not provided by the protein, it would upset the digestive organs if the duty were not divided between them, for excess of carbohydrates is apt to ferment, causing flatulence and acidity, and fat in excess cannot be absorbed.

X. Special Diets in Disease.

Vascular System.—In *Heart Disease* (p. 250), the food must be mainly nitrogenous, and fats and carbohydrates should be limited, the former because they are badly absorbed, the latter because they produce flatulence. The meals should be as dry as possible, fluids being limited, because (1) they are badly absorbed, and therefore apt to interfere with digestion and produce flatulence; (2) they add to the dropsy; (3) they increase the amount of blood the heart has to pump round. Thus, in cardiac dropsy only

20 oz. per day should be allowed, and only 5 oz. at a time. Thirst may be relieved by sucking acid drops. In *acute heart disease*, however, milk or peptonised milk in small quantities at short intervals is often necessary.

Hutcheson gives the following diet for patients with weak hearts: breakfast (8.30 A.M.)—about 1½ oz. buttered dry toast, egg or a little fish, 5 oz. tea or coffee with cream and sugar; dinner (1.30 to 2 P.M.)—fish and meat, or fish and milk pudding, or meat and milk pudding, one potato, 4 oz. hot water (no soup, pastry, or pickles); tea (5 P.M.)—4 oz. weak tea with cream and sugar, but no solid food; supper (7 P.M.)—a little white fish and a potato, or toast with butter, or some milk pudding, or bread and milk; 4 oz. hot water at bedtime.

Respiratory System.—*Bronchitis* (p. 260), when *acute*, requires hot slops (hot milk, broth, gruel, tea, &c.) to promote secretion from the tubes. When *chronic*, the diet is that of cardiac disease, but thin patients should have plenty of digestible fats.

Pneumonia (p. 262) needs the diet of acute fever, care being taken not to overload the stomach. 2 or 3 pints of milk (plain, diluted, or citrated) are sufficient, with ½ pint broth or weak tea, and plenty of water and barley water.

Asthma (p. 266) requires a spare dry diet like heart cases. The last meal should be a small one. In some cases certain foods have to be avoided.

Digestive System.—In *Biliousness*, alcohol, milk, eggs, and all rich foods should be avoided. White meats, fish, toast, vegetables, and fruits should be taken.

In *Hyperchlorhydria* (*i.e.*, excessive secretion of hydrochloric acid in the stomach) (p. 270), the diet should consist mainly of animal constituents (milk, eggs, fish, and meat). Bacon and butter may be eaten freely, but bread and potatoes should be taken sparingly. Condiments, gravies and soups, alcohol, sugar, and all sweet and sour things should be avoided.

In *Flatulent Dyspepsia* (p. 270), green vegetables, fruits,

sugar, jam, soups, and tea should not be eaten. Potatoes should be taken very sparingly. Crisp toast should take the place of bread, and only a little fluid taken at meals.

Diarrhœa.—See p. 272.

Constipation.—See p. 272.

In *Jaundice* (p. 274), the consumption of fats should be restricted, and milk should be avoided or given skimmed. Plenty of fresh vegetables and fruits should be given.

Lenhartz's diet for *Peptic Ulcer* (p. 276) aims at preventing distension by small feeds, healing the ulcer by ample nourishment, and "fixing" the acid of the gastric juice by giving rich protein. The dietary consists of milk and of eggs beaten up with sugar and iced, taken at frequent intervals between 7 A.M. and 9 P.M. The first day 7 oz. milk and one beaten-up egg are given, and the quantity is increased daily by $3\frac{1}{2}$ oz. milk and one egg, until $1\frac{3}{4}$ pint milk and six eggs are reached. From about the third day raw mince is added, and from the seventh day boiled rice; and ordinary diet is reached by the end of the fourth week.

Sippy's diet for *Peptic Ulcer* has been widely adopted. He gives 3 oz. of a mixture of equal parts of milk and cream every hour from 7 A.M. to 9 P.M., and after two or three days a soft egg and 3 oz of well-cooked cereal (rice, oatmeal, farina). Gradually these quantities are increased until 36 oz. milk and cream mixture, three eggs, and 9 oz. cooked cereals are given a day at the end of ten days. Not more than 6 oz. of food must be given at one time. Custards, cream, soups, vegetable purées may be substituted now and then for the milk and cream. At the end of three weeks vegetable purées, potatoes, and cooked fruits may be given, and later bacon and meat broths. A powder containing sodium bicarbonate and magnesium carbonate, or bismuth carbonate and sodium bicarbonate, 10 gr. of each drug, is given half an hour after each feed.

In *Gall Stones* (p. 282), the meals should be rather frequent, in view of the fact that the taking of food into the stomach stimulates the expulsion of bile. The drinking of large quantities of water is advisable.

Urinary System.—*Renal Disease* (p. 286) requires that the work thrown on the kidneys should be lessened, and that ingredients which would irritate these organs should be avoided. Thus, the diet should not be too rich in proteins, and should be free from nitrogenous extractive matters. In *acute nephritis*, not more than 3 pints milk should be given, with cream or starchy cereal, such as rice. In *sub-acute nephritis*, milk and white meats (fish, chicken, veal), cream, cereals, vegetables, and fruits are allowed, but no alcohol and as little salt as possible. In *chronic nephritis*, if too little protein is given, the heart may be weakened; if too much, the blood pressure will increase too much. In some cases a diet largely derived from vegetable sources will be best, with no spices, soups, or alcohol. If the blood pressure is high, the consumption of much fluid at one time is dangerous. In dropsy, fluids should be restricted. Hutcheson says: The animal ingredients should be restricted to one egg, 1 pint milk, and one helping (3 oz.) meat, fowl, or fish daily; sugar and fruits may be taken freely, tea and coffee in moderation. The following are harmful: soups made from meat, gravies, sauces, condiments, alcohol, peas, beans, lentils, radishes, celery, asparagus, rhubarb, and onions.

Dropsy (p. 252) is often lessened by restriction of fluids and a *salt-free diet.* Salt, ordinary bread, salt butter, sea-water fish, and dried, smoked, salted, and preserved foods must be avoided; soups must be made from vegetables and milk; bread must be baked without salt or replaced by home-made scones. Hutcheson gives: breakfast—egg, bread without salt, fresh butter, tea or coffee and cream; 10 A.M.—a glass of milk; dinner—chicken or fresh-water fish, potato, jelly; 3 P.M.—a glass of milk; supper—egg, chicken or fresh-water fish, bread without salt, fresh butter, custard; 8 P.M.—a glass of water or milk.

Skin.—*Eczema* (p. 294), if very *acute*, requires a milk diet. *Chronic* cases require a simple diet with butcher's meat only once daily, a sparing supply of sugar and sweets, bread in the form of crisp toast, free supply of green vege-

tables and no alcohol. In infants eczema is often associated with excess of carbohydrates in the diet.

Nervous System.—*Chorea.*—See p. 317.

Neurasthenia (p. 321).—Weir Mitchell's treatment includes giving 2 to 4 pints of milk daily in two-hourly feeds, thickened after a few days with farinaceous foods. Later eggs, underdone meat, chicken, and sieved potato are gradually added, until the patient takes three large meals a day, with 3 to 5 pints of milk as well as cream and malt extract.

Various Diseases.—*Rheumatic Fever* (p. 325) requires milk, alone or diluted with some alkaline water, during the fever; beef-tea and all fluids containing meat extractives should be avoided.

In *Rickets* (p. 329), the starchy and sugary components of the food should be reduced, and the proteins and fats increased. That is, fresh milk, cream, bacon fat, egg-yolk, butter, and cod-liver oil should be given liberally; and sago, tapioca, arrowroot, and sweetened condensed milk discontinued.

In *Infantile Scurvy* (p. 330), the use of tinned foods and boiled or sterilised milk must be stopped. Orange juice and fresh raw meat juice should be given; also baked potato rubbed up with milk into a thin cream and given through the bottle.

In *Diabetes* (p. 334), the following are *forbidden:* sugar, sweets, jams, marmalade; sweet or dried fruits (grapes, bananas, figs, dates, raisins, currants, prunes); farinaceous foods (rice, sago, &c.); puddings and pastry; potatoes; malt liquors, sweet wines, lemonade, lime-juice cordial. The following are *freely allowed:* animal foods—*e.g.*, meat, fish, game, eggs, cheese (but not liver, sausages, or oysters); clear soups; unsweetened jellies; all green vegetables (but not peas, beans, lentils, carrots, parsnips, beetroot); asparagus, celery, young rhubarb, tomatoes, cucumber, nuts (but not chestnuts). Bread (ordinary, gluten, and bran) and starch-free biscuits are rationed.

PART II.—THEORY AND PRACTICE OF NURSING.

CHAPTER IV.

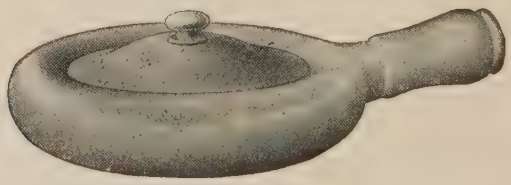
THE CARE OF THE SICK.

I. Ward Work.

The method of cleaning a ward, and the care of furniture, bedsteads, and cupboards, can only be satisfactorily taught in the wards, and so but few words will be said on these subjects here. Similarly with regard to the management of the kitchen, bath-room, and lavatory; the methods of cleaning utensils, baths, lavatories, and crockery; the disposal of soiled linen and dressings; the receiving of new patients; the giving and receiving of reports; and the use of diet sheets, requisition forms, and ward notices. The nurse from an early stage of her training should endeavour to learn the details of these procedures. Even though it may not be her function to undertake some of the duties, she should thoroughly understand them all, so that when she comes to be in charge of a ward she will be able properly to supervise her subordinates.

The morning *sweeping* should not be done until all the beds are made; all the furniture should be moved, except the medicine-chest and tables; and the dust should be collected in a dustpan and burned. When the sweeping

is finished and the fires made up, the *dusting* begins. A clean duster, slightly damped, should be used, and the dust wiped up into it, and not merely flicked away, a dry duster being used to remove any smears. Once a week the furniture is rubbed with furniture polish and a flannel. If a bees-wax and turpentine mixture is used, only a very small quantity should be applied, and it should be well rubbed off, otherwise it will leave a sticky surface. Bedsteads should be carbolised on the discharge of patients. The walls of the ward should be swept each week, and cobwebs removed from the ceiling with a turk's head or a long-handled broom over the bristles of which a cloth is tied. Everything on the table, mantelpiece, and window-sill should be moved, and the tops of screens and other



Bedpan with Cover.

places where dust is likely to lodge should not be overlooked. Painted surfaces should be washed occasionally with warm soapy water ; no soda or gritty soap should be used, otherwise the paint will be seriously damaged. The walls should, of course, be swept before washing. *Cupboards* must be kept tidy, and contain only the articles for which they are intended. The contents of the linen cupboard should be sorted, and arranged neatly in their places. The *baths, sinks*, and *sluices* should be kept thoroughly clean, and well flushed out with water.

Porringers, kidney-trays, and *sputum-cups* should be well cleaned with hot water and soda. In washing *china* and *glass articles*, warm soapy water should be used, followed by careful polishing. *Feeders* should be boiled once daily ; the

spouts should be rinsed with running water and cleaned with a small brush if necessary *Bedpans* and *urine bottles* should be cleansed with a small mop and abundant water each time they are used. They should be soaked in hot water and soda once daily.

Macintoshes should be scrubbed and carbolised on a large board or a table. They should not be allowed to become dry when soiled, but should be placed in cold water until they can be properly dealt with. As soon as they are clean and dry, they should be hung up, or powdered with starch-powder and rolled, for if folded they crack and are no longer water-tight.

The nurse should be circumspect in her management of the ward's stores, and special emphasis must be laid on the need for *economy in the use of hospital property.* It should interest her to know the cost of articles commonly used. Dressings, food, laundry, electricity, and gas form large items in a hospital's expenditure, and a nurse may help considerably by eliminating waste. Unnecessarily large dressings should not be applied. Soiled bandages should not be cut ; unless too flimsy, they may be washed, ironed, and rerolled. Only the amount of methylated spirit, tincture of iodine, &c., likely to be actually used should be poured out of the bottle. When patients leave food on their plates, it is often due to too much having been given at a helping ; a smaller quantity, repeated if desired, would not only have avoided the waste, but would have been more likely to lead the patient to eat. Too much bread and butter should not be cut, and any excess should be covered with a basin or a cloth only slightly damped. Efforts should be made to prevent unnecessary soiling of clothes, as laundry work is expensive. Thus, bed-clothes should not be allowed to touch the floor, diet cloths should be arranged to protect the nightshirts and bed-clothes of children and recumbent patients during meals, and no one should be allowed to sit on the counterpane. Electric light should be switched off when leaving a room empty even for a few moments. Again, with regard to gas, nurses and maids

should understand that, once water is boiling, quite a small flame will keep it so; the jet should therefore be lowered as soon as boiling is established.

II. Care of Linen and Bedding.

The nurse should be economical in the use of *linen* and *blankets*, for these are costly items of a hospital's equipment. Torn linen should not be used, but sent immediately for repair. If damp and not likely to be washed within quite a short time, the article should be dried lest it become mildewed. Stains should be removed at once, for by delay they are apt to become fixed. While bed-linen should be changed often enough to be clean and fresh, there should be no extravagance in this respect, as washing is expensive. New sheets, pyjamas, &c., should always be washed before use on account of the dressing which they contain. Articles used for an infectious patient should be placed in a separate bag, and disinfected before being sent to the laundry. Blankets deteriorate greatly when washed; they should, therefore, be protected by the upper sheet from being soiled, and should never be allowed to drag on the floor; small soiled areas should be washed out at once. For purposes likely to lead to damage, such as wet packs and vapour-baths, cot blankets of light weight, or old blankets specially marked, should be reserved. The *pillow* should be covered by a macintosh if there is bleeding or vomiting. The *mattress*, when a patient leaves the hospital, should be thoroughly brushed and examined for stains and tears, which should be at once appropriately treated. It should then be well aired, care being taken to avoid bending it at a sharp angle. If the case has been an infectious one, the mattress and pillows should be sent to be disinfected.

Removal of Stains.—Stains should be removed forthwith to prevent fixation in the fabric. Soaking in cold water or milk is most generally useful. For *tea, coffee,* and *cocoa*, pour on boiling water from a height. For *milk*

or *cream*, use cold water, followed by soap and hot water. *Vaseline* should be removed with paraffin or turpentine before washing. *Oil* may be absorbed with blotting-paper or powdered chalk ; if the article cannot be washed, apply ether with several folds of clean material underneath, always rubbing towards the centre. For *iodine* stains try carbolic lotion ; on floors use methylated spirit and "hypo." solution. *Picric acid* stains are permanent in woollen and silk articles, but can be removed from linen and cotton by ordinary washing. In case of *ink*, washing with water may be tried if the stain is fresh ; if this fails, soak in milk for several hours. If the ink contains iron, dilute oxalic acid is of value ; if it is an aniline dye, diluted Milton may be tried. In either case, the application should be followed by a thorough rinsing. *Blood*, if fresh, should be dealt with by soaking and rubbing in cold or tepid water until the stain is nearly gone, adding a little ammonia if necessary ; then soapy water should be used. If dry, hydrogen peroxide should be applied, followed by soaking and rubbing. Borax is often useful.

III. The Bed.

Bed-making.—The mattress must be protected by a long macintosh, should the nature of the case make its being stained even remotely possible. The bottom sheet should be put on evenly, and tucked under the mattress tightly. The draw-sheet, which may also have a macintosh under it, should be laid neatly across the bed and firmly tucked in : no wrinkles should appear on either of these sheets. The macintoshes should be withdrawn as soon as they are felt to be unnecessary. The upper bedclothes should be light and warm. The sheet should be turned up at the bottom to preserve a clean end, and over the blankets at the top. The upper clothes should not be tucked in so tightly as to prevent the patient moving his feet freely, while the pillows should be arranged to suit the ease of the

patient and not the eye of the nurse. Only the upper half of the pillow should rest on the bolster. The lower half should lie below the bolster, so that it may support the patient's neck and shoulders. He will then be much less likely to slip down into the bed.

After each meal the draw-sheet should be drawn, so that the patient lies in a cool spot. The mattress should, when possible, be turned once a day, and the bed thoroughly made twice a day. Some patients cannot bear the weight of the bedclothes on their toes, while others complain if it presses on the abdomen. They can be made comfortable if low bed-cradles are used to support the clothes, except one blanket, which is tucked round the feet. Though patients should be encouraged to keep their beds tidy, this must never amount to tyranny. At night the appearance of the beds is a matter of no consequence whatever.

Stripping the bed.—It is convenient that this should be done by two nurses. A chair is placed at the foot of the bed on which to put the folded bedclothes. The sides are first untucked, and the sheets and blankets taken off separately. The bottom third of the article is folded over the middle third, and the top third over all. It is then lifted and placed on the chair, one-third hanging down over the back and the remainder resting on the seat, the end being folded under. It must not be forgotten that the draw-sheet and bottom sheet should be shaken to get rid of crumbs, and that the macintosh should not be folded. If the patient is able to leave his bed or can be lifted on to another bed, the mattress is turned, after being brushed if it has no cover. It is folded over from top to bottom, and part of the wire mattress brushed. It is then drawn to the top of the bed, and, when the rest of the wire mattress has been brushed, it is unfolded, and the bedclothes replaced.

Changing the under-sheet.—The clean sheet is got ready by rolling up half its width. The bed is stripped, the patient being covered with a small blanket. The short macintosh is withdrawn and rolled up with the clean draw-sheet, also for half its width. The patient is turned

over on his side, and steadied there by one nurse, the pillow being first moved a little to that side for the head to rest on. The soiled sheet and draw-sheet are together rolled up towards his back, and any rucks pulled out of the mattress-cover and long macintosh. The clean sheet is laid on the long macintosh, and its unrolled side is tucked in. The clean draw-sheet roll is then laid on this, the free end is tucked in, and the three rolls placed as close to one another and to the patient's back as possible. The patient is then turned over on to the clean side of the bed, the soiled sheet and draw-sheet are removed, and the clean ones are unrolled and tucked in on that side. The soiled clothes should be placed at once in a soiled linen basket or on a dust sheet.

If the patient cannot be turned over in this way, the sheet must be rolled up in the direction of its length. The bed is stripped, and the pillow and short macintosh removed. The soiled sheet is rolled down to the patient's shoulders, and the rolled-up clean sheet is placed in position and tucked in at the top. The patient's shoulders are then raised, the soiled sheet and draw-sheet are rolled down together, and the clean sheet gradually unrolled, the pelvis and legs being raised in turn. The draw-sheet is inserted from the side, the patient being gently raised.

It should be noted that in heart and abdominal cases nursed in the semi-upright position, the position should be maintained during bed-making.

A Divided Mattress consists of three transverse sections, the middle one of which is subdivided lengthways into two. It is used chiefly in cases of fracture of the spine, pelvis, and femur, and in cases of incontinence. It is placed on fracture boards: separate macintoshes and small sheets, well tucked in, are used to cover the upper and lower sections, and a small macintosh and draw-sheet to cover the middle pieces. When the bedpan is needed, this draw-sheet is untucked, the subdivision under the injured side drawn out an inch or two, and that on the sound side removed, the bedpan being inserted in its place.

Operation Bed.—After the mattress has been brushed and covered with the long macintosh, sheet, short macintosh, and draw-sheet, several hot-water bottles are distributed in the bed, and covered by a blanket folded double, and the top sheet, blankets, and counterpane are spread and tucked in at the bottom. When the patient arrives from the theatre, the latter are rolled down together to the foot, the bottles are removed with their blanket, and the patient is placed on the warm bed, covered closely by the hot blanket. The bottles are then arranged around him, and the other bedclothes unrolled and tucked in at the sides.

In another method, the top sheet, blankets, and counterpane are tucked in along one side and half the bottom, being folded over towards the tucked-in side when the patient arrives. The bottles and hot blanket are removed while he is being placed in bed. After he has been covered with the warm blanket and the bottles arranged, the bedclothes are unfolded over him and tucked in at the side and bottom.

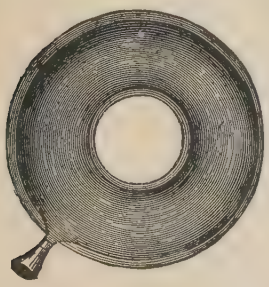
In yet another method, the bedclothes are folded into a neat flat packet, and placed on two hot-water bottles on the draw-sheet, a blanket being warmed at the fire. A convenient way of making the packet is the following: The bedclothes are placed on the bed in the usual order, the sheet being turned down over the blanket at the top. They are then turned up at the bottom; the clothes hanging down on one side are folded over the counterpane, those of the opposite side being folded over these; finally, the bottom is folded over the middle, and the top folded over all. If it is always done in this order, the top layer of the packet will thus belong to the top of the bed. When the patient arrives, the bedclothes are removed until he has been placed on the bed and covered with the warm blanket; they are then placed on him, unfolded, and tucked in.

Special Beds.—When a *steam tent* is required, poles may be fixed to the corners of the cot, and a canopy formed by sheets or a special cover, leaving an opening in one side. A satisfactory tent may be made by using a ward screen in lieu of the tent-poles.

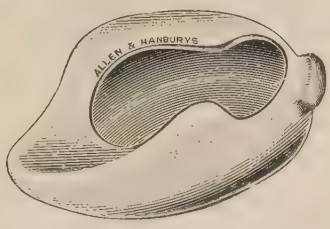
In the *fracture bed*, fracture-boards are placed beneath the hair-mattress and above the spring-mattress.

In a *stump bed*, the stump is laid on a pillow so that it is a little raised above the level of the trunk, a cradle is placed over it, and the bedclothes turned back so that the dressings can be frequently inspected without disturbing the patient, a warm blanket being tucked around the upper part of the limb.

In cases of *Rheumatism* and *Nephritis*, blankets should be placed beneath and over the patient. The arrangement of the bed in *Heart Disease* is described on p. 253. When a limb has been placed *in plaster*, it should be raised by



Circular Water Pillow.



"Perfection" Bedpan.

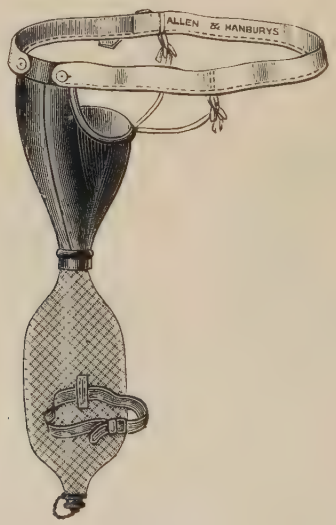
slinging it from a cradle by strips of bandage, or by resting it across a folded draw-sheet ; hot-water bottles are placed around, and the limb is not covered until the plaster is dry.

Air and Water-Beds.—These are most useful when a patient has a bed-sore, or if from the nature of his illness there is a possibility of his having one.

The best and handiest is the *tubular air-bed*, consisting of a number of stout rubber tubes which should be arranged crossways. It has the advantage that one is able to let the air out of one tube at a time, and thus take all pressure off a part. The same device makes the use of the bed-pan much easier. *Air pillows and rings* are also used. These should be distended with a bellows or an air-pump, not

too tightly, and on no account should a nurse attempt to inflate with her own breath, or she may infect herself with the germs of such a disease as enteric fever.

A *water-bed* is necessarily heavier than an air-bed, and fracture-boards should therefore be placed under the hair mattress. The mattress is protected by its cover and a long macintosh, and over the water-bed is placed an old blanket, tightly tucked in. Then comes the bottom bed-



Rubber Urinal, Male, for day and night use.

sheet. After being placed in position, the water-bed is filled with water at a temperature of 90° F. If the bed is made too tense, the patient will tend to roll off it. If it is not full enough, his weight will displace the fluid, with the result that he will rest, not on water, but on the bed beneath it. This should be tested by pressing heavily with both hands held fairly widely separated. The water-bed has to be filled by means of a funnel and cans of water usually, and it is a convenience to move the bed as near

the source of supply as possible. Water-beds must be thoroughly drained and cleaned after use; if a little air is left in them, it will prevent the sides sticking together. Air-rings and ice-bags, when put away, should be treated in the same way.

Note on Care of Rubber Goods.—The life of rubber goods can be materially lengthened by keeping them free from grease and acids, by not exposing them to sunlight, and by laying them flat in a box when not in use. Those worn next the skin (*e.g.*, urinals) must be kept clean by washing daily with strong alkaline soap, or scrubbing with Monkey Brand soap; they should then be dried with a towel, and dusted over with French chalk or talcum powder. Rubber should never be dried by artificial heat, nor by contact with a radiator or stove. Boiling water ruins rubber: a hot-water bottle is not a boiling-water bottle. When rubber goods (*e.g.*, ball-syringes) become hard, soften in warm water. Do not let rubber goods be pressed out of shape by any weight; tubing, for instance, should not be hung on a hook.

The Moving of Helpless Patients.—Every nurse should understand how to move a patient who is very weak or unconscious from one part of his bed to another, otherwise she will drag and not lift him, which is much more tiring for her and unpleasant for the patient. She should never try to lift by herself a patient who is obviously too heavy for her.

If a nurse wishes *to raise in bed* a patient who has sunk down off his pillow, she should place her right hand and arm well behind his back, and the left below the hips, and gradually move him up the bed. He should help himself with the pulley, if there is one and he is not too weak. If he is too heavy or cannot assist her himself, another nurse, standing on the opposite side of the bed, should help, placing her arms in a corresponding position. The difficulty is greatly diminished if one nurse grasps the other by the wrists when their arms are in position.

When a patient has *to be moved across the bed*, the nurse

places her right arm in a slanting direction behind the patient's back, so that his left shoulder presses against her right clavicle, while her fingers come round on to the right side of his chest. The left hand is placed across the front of the chest, beneath the right shoulder. The upper half of the patient is now slightly raised, and steadily moved across the bed. The two hands are now slipped downward, so that one lies in front and the other behind the hips, and the lower half lifted over.

To move a patient from one bed to another the two beds should be placed at right angles to one another, the head of one near the foot of the other. Three persons, *all* standing on the same side of the patient, can then lift and transfer him without difficulty.

The Supporting of Helpless Patients.—To prevent a patient who is weak from slipping down into the bed after being propped up, an air-ring is useful; or the nurse may take a bolster, tie a strong bandage round each end of it, roll a macintosh and a draw-sheet round it, and, after placing it beneath the upper part of the patient's thighs, fasten the bandage on each side to the head of the bed.

Hot Bottles.—See p. 186.

IV. Bathing, Etc.

Bathing a New Patient.—The admission of a new patient to the ward is at once reported to the sister in charge, who in many hospitals decides whether he is to have a bath, or, being too ill, should be washed in bed. The former is naturally preferable. In either case the pulse and temperature would be first taken, and any special symptoms noted.

In the male wards the first bath is given by a male attendant, in the female wards by one of the nurses. If the patient is very dirty, the water should be changed more than once, a few drops of ammonia or a little powdered borax being added to it. It is best to begin with the feet

and legs, hands and arms ; then to change the water, and wash them again together with the body. The head should always be taken last. Soap should not be rubbed on it, but on the flannel, the hair being afterwards thoroughly rinsed. If the knees, elbows, heels, and hands are very dirty, and cannot be cleaned by the application of soap and water, they may be rubbed with turpentine, which must afterwards be carefully washed off, or a plain hot-water fomentation may be applied for a few hours. The bath should be given at a temperature of 100° F., the patient being afterwards thoroughly and quickly dried with a warm towel, and at once put to bed. If a female, a bath-towel or blanket is laid on the pillow and the hair combed out on it, after which the towel or blanket is folded over, and pressed down on the hair, which will thus quickly dry without giving the patient cold.

Bathing a Patient in Bed.—If the patient is too ill to be bathed, he or she may be washed in bed.

Having closed the adjacent windows and placed screens round the bed, the bedclothes, with the exception of the sheet, are turned back, and a long macintosh covered with a bath-blanket laid on the under sheet. The edges of the blanket should overlap down the middle of the patient when he is laid on it. His clothes are now removed, care being taken to keep him covered.

For washing, there are necessary a basin of hot water, a flannel, a piece of soap, two towels, spirit, and dusting powder. The temperature of the water should be about 110°, as it cools quickly. The face is washed first, the body being taken afterwards in small sections, each being carefully dried and covered with the blanket before the next is begun. In this way the front and sides of the body, shoulders, arms, and hands are washed. The water is now changed, and, when possible, the patient turned on his side, and the back, from the nape of the neck to below the buttocks, thoroughly cleansed and dried ; after which the legs and feet are washed, and the water again changed for the head.

When washing the head it is an advantage to have two basins, a small one for soapy water, and a larger one for rinsing. The basin should be brought close to the bed, and as much on a level with the patient as possible. The hair is then well rubbed with soapy water, and afterwards thoroughly rinsed in clean water in the large basin and dried with a warm towel.

If the head is *pediculous*, it should be combed with a small-tooth comb, which is dipped into 1 in 20 carbolic every time it is passed through the hair. If permission cannot be obtained to cut long hair which contains a large number of pediculi, it may be treated in the manner recommended by Dr Whitefield: Place a basin of warm 1 in 40 *carbolic lotion* on a chair at the side of the bed. Take away the pillow and spread a bath towel on the bed by the basin, and place the patient with her head over the side of the bed and her hair hanging into the basin of lotion, with which the whole of the scalp and hair must be thoroughly saturated, a piece of lint or wool being used as a sponge. At the end of five minutes the hair is wrung out and then wrapped in the bath towel, the ends of which should be folded across the nape of the neck. The pillow should be protected by a folded draw-sheet. An hour later the head can be washed. It is a good plan if a head is teeming with lice to treat it at once in the manner just described, and to wash the patient afterwards, as this will prevent the lice escaping from the head. A compress of *oil of sassafras* may be used instead; it is somewhat expensive, but it kills lice with great certainty.

For the removal of *nits* each nurse has her own pet remedy, which she thinks the only one that is really efficacious. Turpentine, vinegar, and methylated spirit are all said to bring about this highly desirable result. At some institutions diluted liquor potassæ is applied to the hair, not to the scalp, and the softened nits are rapidly removed by a special metal fine-toothed comb. The hair is then quickly washed to free it from the liquor potassæ. *Pediculosis* leads to scratching, which may result in sores,

impetigo, and enlargement of the lymphatic glands near-by.

In washing a patient, the nurse should pay particular attention to such parts as the ears, eyes, nostrils, axillæ, umbilicus, the part between the buttocks, the groins, knees, heels, and in stout women under the breasts. In fat people the skin under the breast, and also that between the buttocks, should be powdered twice a day. Care should be taken to avoid any unnecessary exposure of the patient. Any lumps, scars, or sores there may be on the body should be reported to the sister. Scaly patches on the scalp that might be *ringworm* should also be looked for in children.

Directly the bathing is finished, the patient is put comfortably to bed, a hot-water bottle being given him if necessary. An hour later, when he has quite settled down, his pulse and temperature are again taken.

The patient's clothes should be carefully examined, those that are dirty or contain parasites being sent to the laundry and disinfecting chamber respectively, the others being tied in a neat bundle and disposed of according to the arrangements of the particular hospital.

If a patient, too ill to go to the bathroom, is *admitted with body lice,* his clothing should be placed on a sheet, and the nurse should wear an overall while giving the blanket bath. After the cleansing process, the axillary and pubic hair should be smeared with white precipitate ointment. The overall, bath blankets, and patient's clothing suitable for baking should be sent to the disinfector in the sheet or in a bag. On discharge, the mattress and bedding should be baked.

Daily Wash.—Each morning, the upper bedclothes and sheet having been folded back and the nightdress removed, the patient should be washed to the waist, back and front, lying the while between two blankets, or between a blanket and a warm bath towel, the latter being placed between him and the under sheet. The hands should be washed in the middle of the day, and the hands and face again washed at night before the bed is made. The hair should be well brushed each day. The brushes and combs must be kept

clean by being washed at least once a week. When a patient who has had ringworm of the scalp leaves the hospital, his brush and comb ought always to be burnt. Heads that were pediculous on admission, or contained nits, must be carefully examined and combed every day.

Care of the Mouth.—If the patient is too ill to attend to his *teeth* himself, the nurse must do so for him. She may use a tooth-brush or small pieces of stick, about the size and thickness of a penholder, round one end of which is wrapped a thin shred of absorbent wool or a narrow strip of lint. When the teeth are very dirty, dipping the wet wool or lint into prepared chalk before rubbing them will materially hasten the cleansing process. Patients able to do so should be made to use a tooth-brush.

For cleaning the *roof of the mouth and back of the throat* the finger, with damp wool wrapped round it, should always be used. The lint or wool should be dipped in a solution of boroglyceride, borax and lemon juice, or peroxide of hydrogen, and the gums, tongue, roof of the mouth, and both sides of the teeth thoroughly rubbed, each piece of lint or wool being used once, and only dipped into the mouth-wash when clean. If the *tongue* becomes thickly coated it may be gently scraped; a teaspoon is useful for the purpose, the patient rinsing his mouth, during the process of cleaning, with dilute glycothymoline.

In any disease which causes a high temperature, the teeth may become covered with *sordes*, which gives them a very dirty appearance. In such cases a dry brown tongue is an indication for giving the patient more water to drink. Sordes are the secretions of the mouth which have collected upon the teeth and dried there. In health they are prevented from collecting by the process of mastication. In acute illnesses the mouth ought to be cleaned as often as every four hours; in less severe cases once or twice a day may be frequent enough. For obvious reasons this should be done before rather than after a feed. A dirty mouth causes discomfort and loss of appetite; it may lead to septic ulceration of the gums and fauces.

Care of the Eyes.—When suffering from extreme exhaustion, patients frequently sleep with the eyes half open, in consequence of which the conjunctivæ become irritated by dust. In such cases the eyes should be carefully bathed with boracic lotion.

Care of the Skin.—In a small minority of cases a *bed-sore* is pardonable. As a rule it is the result of imperfect care on the part of the nurse. To prevent, as far as possible, the occurrence of this highly undesirable complication, every nurse should make herself thoroughly acquainted with the causes of bed-sores, their earliest symptoms and usual situation, and their treatment.

V. Bed-sores.

Bed-sores have a great tendency to form on those parts in which the circulation is feeble, so that the blood stagnates in the tissues, which therefore do not receive a sufficient supply of food; consequently their vitality is lowered and they readily respond to slight injuries. The skin goes successively through the stages of redness, abrasion, and slough.

Causes.—(*a*) *Pressure—e.g.*, when occurring over the lower part of the back, and on the heels, hips, and shoulders. Fat people, owing to their weight, are especially liable to this form of bed-sore. Going to the other extreme, thin people are also very liable, because there is no fat to protect their skin from pressure by the bones.

(*b*) *Irritation.*—Constant friction so irritates the skin that at last it becomes inflamed, and a bed-sore is the result. This kind of bed-sore occurs on the elbows, back of the head, and inner sides of the knees and ankles, owing to their rubbing against one another.

Patients with incontinence of urine are prone to bed-sores, the skin of the part that is wet becoming sodden, and so readily yielding to pressure. Constant irritation by the urine also causes it to inflame.

Creases in the under sheet and crumbs in the bed may cause sufficient irritation to produce a bed-sore.

(*c*) *Impaired Nutrition from Disease.*—All bed-sores result from impaired nutrition of the part. Under this heading is included that special impairment which goes with disease of the spinal cord, and which is due to an interference with the nerve-supply of the part (trophic change). This is the most difficult form of bed-sore to prevent.

We may say, then, that bed-sores are caused either by pressure or irritation due to friction, predisposing factors being extreme emaciation, great weight, incontinence of urine and fæces, trophic change, and the want of proper attention on the part of the attendant.

Prevention of Bed-sores.—No method of prevention is better than the *frequent application of soap and water.* A nurse should never wait for the patient to complain of his back before beginning its use. Twice a day, at least, all patients who are confined to bed should have their backs and hips washed. The soap should be thoroughly washed off, and the skin well dried and powdered, particular attention being paid to the fold between the buttocks.

The skin may be treated after washing in either of the following ways :—

(*a*) *Spirit* in some form may be applied—methylated spirit, brandy, or eau-de-Cologne being used. Whichever is used must be thoroughly rubbed in. This will increase the flow of blood through the skin and so improve its nutrition.

(*b*) Some *emollient ointment* may be well rubbed in.

By the first method the skin is hardened, and in illnesses which are not likely to last long it is the most suitable. By the last method the skin is softened and rendered pliable, and the massage that is necessary to rub the ointment *into* it is good for the vitality of the part by improving the circulation in it. In all cases where the sphincters are relaxed, the skin should be treated with ointment. This will protect it from the irritating effects of the discharges,

the patient being always washed and rubbed when he requires cleaning. The palm of the hand and not the finger-tips should be used for applying the ointment.

Those parts which have been mentioned as liable to break down with pressure should be *examined daily and regularly washed.* The heels, which after the back and hips are the most likely to become sore, must be carefully attended to, pressure being taken off them by ring cushions made of wool and covered with a bandage, or the heels and ankles may have wool bandaged round them. Ring cushions made of wool are often recommended for the purpose of relieving pressure on the back, but are of very little use; indeed, with a restless patient they become a positive danger. Water- and air-beds, by equalising the pressure, are of the greatest possible value. In their absence, ring cushions constructed on the same principle are sometimes very useful. The knees, ankles, and elbows may be protected by firmly bandaging a thick layer of cotton-wool round them.

Second only to washing as a preventive measure is a *change of posture.* This not only removes for a time all irritation from the part, but is of the greatest possible value in preventing stagnation of blood in it. When possible, such a patient should never be allowed to lie more than two hours in one position, but be turned first on to one side and then on to the other, and kept there by the skilful arrangement of cushions.

Symptoms.—The first obvious symptom is a reddening of the skin, but even before this appears the patient may complain of a burning or pricking sensation. This should at once put the nurse on the alert. The patient may, however, be too ill to feel any discomfort; or, owing to paralysis, there may be no sensation in the part. A thin evenly applied pad of absorbent wool kept in place by a bandage, coupled with careful massage of the part, may even yet avert the threatened sore.

The sore, when formed, may consist of nothing more than an abrasion of the skin; or a large slough may gradu-

ally separate, leaving behind a deep cavity, frequently with bone exposed at the bottom of it.

Treatment.—The prevention of bed-sores is the duty of the nurse; but the first sign of one should be at once reported to the physician or surgeon in charge of the case. He may, if it results in nothing more than abrasion of the skin, leave the further treatment in the hands of the nurse. In such a case a pad of lint dipped in friar's balsam may be applied, covered with gauze. This seals the part, and prevents the sore being rubbed by bedclothes or irritated by extraneous matter. Or zinc ointment may be used spread on a piece of lint of the same size as the sore, covered with gauze, and retained in position by strips of strapping. By every possible means the nurse must strive to keep all pressure off the bed-sore.

When a slough has formed, its separation should be hastened by the use of antiseptic fomentations, which must be cut so as to fit the sore exactly. They are usually discontinued after the slough has come away. If the sore is in the sacral region, a pad of wool should always be placed between the patient's back and the edge of the bed-pan.

To sum up, the prevention of bed-sores in many cases requires a care as unremitting as it is faithful. A day's neglect may undo the work of weeks, and add a very unnecessary burden of discomfort to the patient. The bed must be kept smooth, and no crumbs allowed to remain in it; the application of soap and water must be regular and efficient; if ointment is used, it must be rubbed into, and not on to the skin; and the patient must not be allowed to remain too long in one position.

VI. The Excreta.

The Passing of Urine.—*Women* sometimes at first find a difficulty in passing water into a bed-pan. The position is novel and awkward, especially if the pillows are low. The nurse must exercise the utmost patience, not allowing

her to remain too long on the pan at a time, but removing it and giving it again a little later. A hot sponge, quickly replaced by a cold one, may be held to the meatus, or the external genitals douched with hot water. If this has no effect, it may become necessary to pass a catheter, but this should only be done by the doctor's orders, and the patient may wait some hours before it is necessary.

When there is any risk of the urine shooting over the pan into the bed, the patient may be given a piece of brown wool or a small kidney-tray to hold in front, so that she may direct the flow of urine into the bed-pan.

Male patients only use the bed-pan when the bowels are going to act ; for urine they use either a small chamber or a bottle ; the former is the more easily kept clean. It should be removed from the ward as soon as it has been used, and washed once a day with soap and water.

When a male patient is unable to pass water, a fomentation applied to the lower part of the abdomen may be efficacious. The running of water from a tap near-by is often useful. After certain operations it may be possible to allow him to kneel.

The *urine*, with its abnormalities and examination, is dealt with on p. 104 *et seq.* ; the *stools* on p. 271.

Bed-pans are usually made of glazed earthenware or aluminium, as these are very easily kept clean. They should be warmed before use by running hot water through them. The commonest and most useful shapes are the circular and the slipper. The nurse should place her left hand almost under the pelvis, and help the patient to raise himself, telling him at the same time to draw his knees up, the bed-pan being then placed in position. Before attempting to remove it, the patient should be lifted right off it.

After use it should at once be covered with a cloth. It is then straightway removed from the ward, and, unless needed for inspection, at once emptied, the pan being thoroughly flushed with cold water. At least once a day it should be washed with soap and water. No soda may be used in cleansing an aluminium bed-pan.

VII. Keeping of Specimens.

(*a*) *For Inspection.—Urine* is put in clean specimen glasses, which are then stoppered with wool and kept in a cool place. Specimens should be taken from the early morning urine ordinarily. When a specimen is required of the urine passed in twenty-four hours, all that collected should be stored in a covered urine measure or bowl in a cool place; endeavour should be made that as far as possible the urine may not be passed into the same vessel as a stool. The bladder should be emptied at the beginning and the end of the twenty-four hours. When a specimen of urine is required from a patient who is menstruating, the vagina should be plugged with cotton-wool to prevent the blood from contaminating the urine.

Ascitic fluid also is put in a specimen glass. *Discharges* are shown on the inner dressings, pads, or squares on which they have been received; these are folded to expose the stained surface, and kept covered in a bowl. *Fæces* may be left in the bed-pan, or emptied into a glass bowl; toilet paper should be removed, and the vessel, covered by a sheet of glass or a cloth wrung out in carbolic lotion (1 in 20), should be placed in the lavatory near the window. *Vomit* may be kept in a convenient vessel.

(*b*) *For the Laboratory.*—All specimens should be labelled with the date, name, and nature. The material is received into a sterile, dry, wide-mouthed bottle or specimen glass and corked tightly, or plugged with sterile non-absorbent wool. Too much must not be placed in the receptacle. *Stools* should always be sent when quite fresh and warm, especially when they are to be examined for living organisms. To avoid contamination, catheter specimens of *urine* may be required if there is any vaginal discharge, or if a bacteriological examination is to be made. (See p. 162.)

VIII. Care of the Dead.

Soon after death the condition called *rigor mortis* begins to set in, as a result of which all the muscles of the body become stiff and rigid. In anticipation of this, the nurse, as soon as the friends have withdrawn, closes the eyes, when necessary retaining the lids in position with pads of wet lint, straightens the limbs, and closes the mouth. The lower jaw is supported either by means of a roller bandage placed under it, or by passing a couple of turns of bandage round the point of the chin and over the head. To prevent it slipping, the bandage should be split in the centre where the chin rests on it. When the muscles have firmly set, the support is removed.

About an hour after death the nurse should proceed to "lay out" the dead body. It is first washed all over with soap and water, and the rectum and vagina packed with absorbent wool to prevent the escape of discharges, or an oakum pad and binder may be used instead of plugging. The ankles are tied together with a broad strip of bandage, fresh dressings placed on any wound, the hair brushed and neatly done, and a night-gown put on. Before washing a patient in a hospital, any rings or earrings should be removed from the body and given to the steward of the hospital. In no case should the body be removed to the mortuary with any ornaments on it, nor should the nurse herself deliver them to the patient's friends, otherwise they may pass into the possession of the wrong individual. If the death has occurred in a hospital, the patient's name and also that of the ward, together with the hour at which death occurred, are written on a slip of paper which is then pinned on the front of the night-gown. Over all a clean sheet is thrown. The body is now ready for removal to the mortuary.

In a private house the nurse should not hurry away directly she has finished laying out the body, but should wait to see if she can be of any further help to the friends.

Before leaving the room, she should see that everything is in order.

Signs of Impending Death.—More than half die in coma. The pulse becomes fast, irregular, and gradually imperceptible, the respiration slows, and the skin is cold and clammy. The face is pale or cyanosed, the eyes are sunken and hollow, the temples are collapsed, the nostrils are pinched, and the ears, which are cold and transparent, have the lobes turned outwards. Finally, the lower jaw drops, the eyes become fixed, and a haziness comes over the cornea ; then the well-known rattle of mucus is heard in the trachea, and the end has come.

IX. Notes on Routine Hospital Work.

1. **Ward Work.**—The *Day Nurse* begins her duties by receiving the report from the night nurse, and then goes round the ward. She looks to the adequacy of the ventilation, inquires of each patient how he feels, remedies as far as she can any discomfort, and sees whether any dressings or splints have become displaced. The division of duties between day and night nurses as regards bed-making, toilet of patients, and the giving of breakfast varies in different hospitals. The day nurse does whatever is her share of this work. When the maid has swept the ward and attended to fires, the nurse straightens the beds, dusts, arranges the flowers, gives lunch to the patients, offers bedpans, and completes her preparation for the visit of the house physician by taking the temperature and pulse of the seriously ill patients, or that of the house surgeon by preparing the dressing trolley. She then does, or assists in doing, the dressings and special treatment. After the patients' dinner comes their toilet. Then she may have to accompany a case to the operation theatre, or prepare for the visit of physician or surgeon. Operation cases, particularly abdominal cases, require attention in ways described in full in the appropriate chapter. Tea is followed

by the preparation of any patients who are to be operated on on the following day (aperient, shaving, baths, &c.); by bathing the other patients, either in bed or in the bath-room; and by taking temperatures, &c. The day concludes with the serving of the patients' supper, tidying of the ward, and the writing of the report and instructions for the night nurse.

The *Night Nurse* receives the day report, and similarly walks round the ward inspecting the patients, especially those who have been operated on during the day. She inquires of the restless ones the cause of their sleeplessness, removing blankets from those who are too hot, giving hot-water bottles to those who are cold, and hot drinks to those who are sleepless. She also satisfies herself that splints and bandages are in position, that blood has not come through the dressings of cases recently operated on, notes the special points in connection with the after-care of operation cases detailed elsewhere, attends to any post-anæsthetic vomiting, and sees that the circulation of limbs recently encased in plaster is satisfactory. She takes the four-hourly pulses and temperatures, and is ready at the visit of the resident doctor to report to him on such matters as pyrexia, pain, sleeplessness, cough, increasing weakness, &c., among her patients. She gives bedpans and urinals and refills hot-water bottles as required during the night; changes fomentations, gives medicines and enemata as ordered; and pays attention to the ventilation and temperature of the ward, especially in the early morning. At some hospitals she also cuts dressings and packs the dressing-drums ready for sterilising. She undertakes her share in bed-making, toilet of patients, and the giving of the breakfast. Finally, she makes an entry in her report book, and gives a verbal report also to the day nurse.

2. **The Admission of Patients.**—New patients should, of course, be received in the kindliest way, and should be reassured if at all nervous. The nurse should quickly make herself acquainted with the entries on the admission card, particularly as to the nature of the illness and any

instruction as to bathing, diet, and treatment. The pulse and temperature should then be taken, and the general condition and any special symptoms noted. These should be reported to the sister, and instructions received as to bathing. If the patient has pyrexia or pain, or is otherwise at all ill, or is wearing a dressing or splint, he will be blanket-bathed; otherwise he may be cleansed in the bath-room. If he is collapsed, even blanket-bathing should be postponed, and he should be got into bed quickly and given hot-water bottles and wrapped in warm blankets. If he is to be blanket-bathed, screens should be placed round the bed, the neighbouring windows closed, and his clothing removed. It is often necessary to do this with the patient lying on the bed, the bottom sheet of which is covered with an old blanket and macintosh. If a simple fracture of the arm is suspected, the sleeve containing the sound limb should be drawn off first. In the case of a compound fracture, the seam of the sleeve on the injured side should be cut up, and also the shoulder seam, and the coat afterwards drawn off the uninjured limb. In a fracture of the lower extremity the boots are first carefully taken off, the injured limb being firmly held while this is done. The outer seam of the trouser-leg on that side is then cut up, and the garment afterwards carefully drawn off the sound limb. The patient is given a hot-water bottle, if necessary, and his nightshirt is warmed on a radiator or on a chair in front of the fire. The bathing operation includes cutting the nails, attending to the mouth, combing the hair, and the application of a sassafras cap if there is pediculosis. At the conclusion the patient should be offered the bedpan or urinal, and a report on the condition of the body and the presence of sores, ringworm, or pediculosis made to the sister. The urine is saved for testing, and the stool for inspection. Often in cases of accident it may be necessary for the medical officer to clean up and suture a wound, or set a fracture, before the patient receives a general cleansing. In this case the nurse gets ready at once the trolley with sterile dressings and towels, soap and

water, ether, antiseptic solution, swabs, sutures, kidney tray, razor, and splints, and sterilises scissors, forceps, and needles.

The patient's clothes are examined, and dealt with as described on p. 77. Valuables should be sent with a list to the hospital steward to be kept under lock and key; watches, rings, and a little money may, however, be retained by the patient if he so desires and accepts the risk. If a patient is brought in after an accident, endeavour should be made to ascertain his address either from himself or from the contents of his pockets or from the person who has brought him in. The latter should be detained until a history has been obtained by the doctor. Pending the arrival of the doctor, first-aid should be applied if the condition is urgent (pp. 229-236). If an operation is needed in the case of a child, it is necessary to get the parents' consent, and they should be communicated with by messenger, telegram, or telephone.

3. **Prevention of Infection in Wards.**—Particularly in children's wards the nurse can render valuable aid in preventing the entry and spread of infection. With ordinary care she will not overlook pediculosis, or scabies and ringworm of scalp and body either, provided she has read carefully the description of these diseases and has lost no opportunity of inspecting recognised cases. All cases of vaginal discharge should be reported, and small girls examined for vulvitis. All discharges from the eye may also be regarded as contagious, some being more serious than others. Soreness of the nostrils and nasal discharge often indicate a diphtheritic infection of the nasal cavities, and may start an outbreak of ordinary diphtheria in the ward. Pyrexia not otherwise accounted for may indicate the onset of one of the common infectious diseases. Cough, especially if spasmodic, in a child admitted for an ailment not connected with the respiratory organs, should be regarded as suspicious of whooping-cough. A croupy cough may indicate the onset of measles or diphtheria. Sore throat may mean, not only tonsillitis but the

beginning of scarlet fever or diphtheria. All rashes should be reported at once. Erysipelas is especially serious in a surgical ward.

Whichever of the above is found—apart from pediculosis of the scalp, which is treated at once with a sassafras cap and combing—the patient should be isolated until he has been seen by the doctor and suspicions confirmed or disproved. In other words, all his or her utensils (cup, plate, spoon, knife and fork, bed-pan, urinal) should be marked and kept separate. Toothbrush, face flannel, and towels should also be kept apart, soiled bedclothes and personal clothing should be placed in a disinfection bag, and sent to the disinfector on its way to the laundry; and the other children should be kept well away, it being generally the best practice for them to stay in bed, unless the suspected child can be moved to a separation ward at once. If a separation room is vacant, the nurse will usually be doing the right thing if she moves the patient's cot there pending the arrival of the doctor, if he cannot attend at once. If he confirms the diagnosis, the child will be transferred elsewhere for appropriate treatment.

4. **Fever Ambulance Work.**—One important item of the duties of an ambulance nurse may be referred to here—namely, the necessity for obtaining an adequate and accurate history of the case. The inquiry form which she has to fill in generally asks whether there are other children in the home who have not already had the disease (if there are, the patient is often kept in hospital longer than if there are not); what other infectious diseases the patient has already had (in times of pressure a bed in a ward which is in quarantine for one of these diseases can then be used for the patient; or if his ward goes into quarantine for one of these diseases, his discharge need not be delayed on this account); the nature of the symptoms and the order in which they appeared (this may help in confirming the diagnosis—*e.g.*, vomiting is common in scarlet fever and diphtheria, much less common in measles; in measles the

rash appears on the fourth day, in rotheln on the first day, in scarlet fever usually on the second day; in diphtheria the date of onset is of the greatest importance, for on the length of the illness depends the dose of antitoxin given); whether the child has been given antitoxin in the present illness, and if so how many units and when; and finally, if the case is one of diphtheria, whether the patient has ever had antitoxin before, or is subject to asthma (these patients often tolerate antitoxin badly).

5. **Stocktaking.**—In most hospitals the matron and steward take stock of the ward's equipment annually. In order that the deficiencies may be few, it is desirable that the sister and her nurses should check at least some of the items much more frequently. Ward instruments, crockery, glassware, knives, forks, and spoons should be checked weekly, and as far as possible bedclothes, personal clothing, and house linen once a quarter.

In anticipation of the stocktaking a strictly accurate record is made of the articles sent away to the public laundry, particular attention being paid to the ward-marks. Further, with regard to any clothing under repair, the needle-staff complete the work so that it can be returned to the wards and homes. On the evening before the stock-taking the linen cupboards are emptied, and the articles arranged in piles with the ward-marks showing. Any bearing the mark of another ward are transferred at once to that ward. The hardware is also arranged conveniently for counting. In the morning the matron and her assistants count all the items, including those in use or in the soiled-linen basket, and the totals are compared with those recorded on the inventory card. At hospitals which have a laundry of their own, it is often convenient to take the inventory during the week-end, when it can readily be arranged that no clothing remains in either the laundry or the needle-room.

In equipping a ward, allowance has to be made for articles broken or awaiting replacement and for clothes

at the laundry. A common equipment, per ten beds, of the following items is—

Bedding—	
Mattresses	10
Mattress covers	12
Pillows	24
Bedclothes—	
Pillow-covers	30
Pillow-cases	50
Counterpanes	15
Blankets	40
Sheets	50
Draw-sheets	40
Waterproof sheets, short	10
Waterproof sheets, long	10
House-linen—	
Bath-towels	25
Hand-towels, patients'	30
Patients' clothing—	
Vests	30
Nightgowns or nightshirts	40
Nightingales or jackets	25
Handkerchiefs	80
Face flannels	15
Dressing gowns	3

When draw-sheets, sheets, nightgowns, and vests are returned from the laundry once a week only, a larger stock of these articles is required; similarly in wards reserved for children or incontinent patients.

CHAPTER V.

PULSE, RESPIRATION, TEMPERATURE, AND URINE.

I. The Pulse.

It is essential that a nurse should have a sufficient knowledge of the pulse to be able to tell by it whether her patient is gaining or losing strength, otherwise she may, especially at night-time, overlook a change for the worse in a patient.

The Pulse is the wave of distension felt in an artery as blood is pumped into the arterial system with each systole of the left ventricle. It may be felt in the radial artery at the wrist, the temporal artery in front of the ear, the facial artery over the lower jaw, and the carotid artery in the neck; and it can be seen in the fontanelles of an infant.

When examining a pulse the nurse should place two, or better still, three fingers upon the artery, the radial at the wrist being the one generally chosen. The pulse should be counted for half a minute. Care should be taken that the elbow is not bent, since that hinders the flow of blood through the brachial artery, and so makes the pulse at the wrist appear smaller than it really is.

In examining the pulse a nurse should take note of its frequency, volume, compressibility, and regularity.

(1) **Frequency.**—By the frequency or rate of a pulse is meant the number of beats which can be felt in a given time. Usually the normal pulse rate of an adult is 72 per minute, but it may vary in health between 60 and 80. In children it is more frequent —*e.g.*, about 100 at the age of six years and 120 in infancy. It is more frequent in the sitting-up than in the lying-down position.

A frequent pulse (tachycardia) occurs in pyrexia, shock and collapse, neurasthenia, Grave's disease, tobacco poisoning, &c. A pulse that, with a stationary or falling temperature, gets more frequent day by day, is the surest indication of a failing heart. A "running" pulse is one that is so frequent, and at the same time so small, that it cannot be counted. All that the finger seems to feel is a kind of tremor in the artery. It occurs, for the most part, in those who are moribund.

A slow pulse (bradycardia) occurs in intracranial pressure (due to meningitis, tumour, apoplexy, depressed fracture), toxic coma (due to uraemia, alcohol, narcotics), jaundice, certain diseases of the heart (aortic stenosis, heart block), and debility after illness. It is not uncommon in old people.

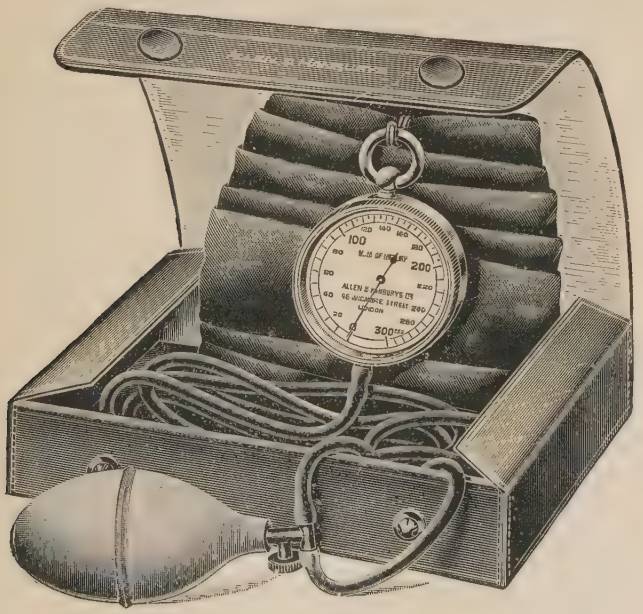
(2) **Volume.**—*A full pulse* is one that feels larger than normal to the finger, and is the usual accompaniment of febrile conditions.

A small pulse is one that feels smaller than normal to the finger. It is a sign of heart weakness, since it shows that that organ is not keeping the arteries as full of blood as it should. It must not be forgotten that some people in good health have small pulses, and that the small pulse of kidney disease is due to quite a different cause.

(3) **Compressibility.**—Is it a hard or a soft pulse? Is its *tension* high or low? That is to say, does one have to press firmly or lightly on it to stop its beating? The nurse should make herself familiar with the normal pulse and the ease with which it may be stopped by pressure. If accurate observation is required a *sphygmomanometer* is

used ; it consists of a rubber bag encircling the arm, and connected with a pump and a manometer to measure the pressure.

A hard pulse is present in inflammation of the kidneys, and, to a less extent, in gout. When it is present, there is said to be a condition of "high arterial tension" or tightness, since the arteries are tightly distended with blood.



Sphygmomanometer.

For this reason the size of the beats is small. Firm pressure with the fingers is required to stop its beating.

A wiry pulse is one that is both hard and very small.

A soft pulse is also called a "compressible" pulse, since its pulsation is too easily stopped by light pressure with the fingers. It is a sign of heart weakness, since it

shows that the heart is not sufficiently distending the arteries with blood.

A dicrotic pulse is a variety of the soft pulse, and occurs most frequently in the late stages of enteric fever. Each beat is followed by a smaller secondary beat, hence the name, since "dicrotic" signifies "two strokes." For every beat of the heart one feels a large and a small beat at the wrist. The dicrotic, like the soft pulse, is due to imperfect filling of the arteries with blood. It is not necessarily a dangerous symptom.

(4) **Regularity.**—*An Irregular Pulse* is one in which the beats vary either in—

(*a*) *Force,* strong beats being followed by weak beats, and *vice versa,* or

(*b*) *Rhythm,* where there is not always the same interval between the beats. The pulse goes quickly, then slowly, and then quickly again.

This is a serious condition, which is most often found in disease of the mitral valves of the heart; also in severe diphtheria. When, in advanced mitral disease, the auricles, owing to the prolonged strain, have lost the power of contracting in co-ordination (a condition which is known as "auricular fibrillation"), a wildly irregular pulse with many beats imperceptible at the wrist occurs.

An Intermittent Pulse is one which occasionally drops a beat; this is due to a premature beat (also called an "extra-systole"), which is not felt at the wrist. It is not a dangerous symptom, being not infrequently due to dyspepsia or excessive smoking. It must not be confounded with the irregular pulse.

In conclusion, what nurses have especially to note is the rate of the pulse and its volume, remembering that the more frequent, the smaller, and the softer the pulse, the greater the cardiac weakness, and, consequently, the more dangerous the condition of the patient.

II. The Respiration.

A nurse should never let the patient know when she is counting his respirations, otherwise he will unintentionally alter their frequency. After counting the pulse she should, without moving her fingers from the wrist, quietly observe and take note of the movements of the chest, counting for the full minute. In health there is one respiration to every four pulse beats; consequently, an adult with a pulse rate of 72 breathes 17 or 18 times a minute. At birth the respirations are about 40, and in the second, third, and fourth years about 25 per minute.

Dyspnœa, or difficulty in breathing, is a symptom that may be present in several diseases. It varies very much in character, as well as in severity and duration. The two great causes are heart disease and obstruction in some part of the air-passages.

In bad cases of *heart disease,* where that organ is much dilated, and hence too weak to do its work, breathlessness is often continuous and very distressing. Such patients will sit bolt upright in bed (*orthopnœa,* or upright breathing) for many hours at a stretch, with blue lips and heaving chests, vainly trying to get enough air into their lungs, and slowly dying one of the most painful of deaths. As a rule, they are more comfortable sitting up in a chair, or if they are strong enough, kneeling in an arm-chair with their arms hanging over the back of it. This posture brings them most relief, because it allows the abdominal viscera to sink downwards, and thus gives freer play to the heart and lungs. The appearance of the ward should never be allowed to interfere with the comfort of these patients.

In *inflammation of the larynx,* such as is met with in diphtheria, inspiration is long and whistling or crowing in character; and, if the obstruction is severe, there is, at the same time, a sinking in of certain parts of the chest wall.

In *acute bronchitis* respiration is laboured, and accom-

panied by wheezing and cooing sounds, the patient having to be propped up in bed.

In *acute pneumonia*, unless the accompanying pleurisy makes breathing painful, there is no dyspnœa. The respirations are much increased in frequency, but there is no obstruction to the entrance of air into the working part of the lungs.

In *asthma* the dyspnœa is most intense and alarming, though a fatal termination is very rare. An attack usually comes on at night, and lasts a variable time. While it is present the patient sits upright in a chair, gripping some support firmly with both hands, so that he may throw more power into the muscles of inspiration. Expiration is very prolonged and wheezing.

In *inflammation of the kidneys* dyspnœa sometimes appears. It is an extremely grave symptom; cases which show it almost always terminate fatally.

Other Abnormalities.—*Sighing respiration*, in which long deep breaths are taken without dyspnœa or panting, appears in some cases of diabetes a short time before death. In that disease it has received the name of "air hunger." Sighing respiration also accompanies the heart paralysis of diphtheria, and it is a symptom of severe hæmorrhage. If, therefore, the nurse is in charge of a case of enteric fever, or of a surgical case that has been recently operated upon, she should, on hearing this form of breathing, pay most careful attention to the pulse and general condition of the patient, with a view to determining the presence or absence of other symptoms of hæmorrhage.

Stertorous breathing is characterised by a loud snoring inspiration. It is commonly present in patients who are comatose.

Shallow respirations are most commonly seen either in shock or collapse, in which there is great depression of the vital powers, or in peritonitis or pleurisy, where a full respiration is prevented by the pain to which it gives rise.

Cheyne-Stokes breathing is a very extraordinary form of

respiration, which sometimes shows itself in patients who are unconscious as a result of brain disease. As a rule, it appears shortly before death, though very occasionally recovery takes place. It is characterised by a gradual deepening and quickening of the respirations; after reaching a certain pitch of intensity they gradually subside, until at last respiration ceases altogether. After a pause lasting several seconds, breathing recommences, and again goes through the same gradual rise and fall.

III. The Temperature.

1. **In Health.**—The temperature of an adult in good health should be about 98.4° F. This is called the *normal temperature* of the human body. It does not, however, remain at that point throughout the twenty-four hours, but rises slightly towards evening, reaching its highest point (99°) between 4 and 6 P.M. During the night it slowly falls, until between 2 and 4 A.M. it has reached its lowest point, viz., 97.5°. There is, therefore, each day a steady and regular fluctuation between 97.5° and 99°. These two points are taken as the limits for health—*i.e.*, a temperature above 99° or below 97.5° is usually indicative of some disturbance of the system.

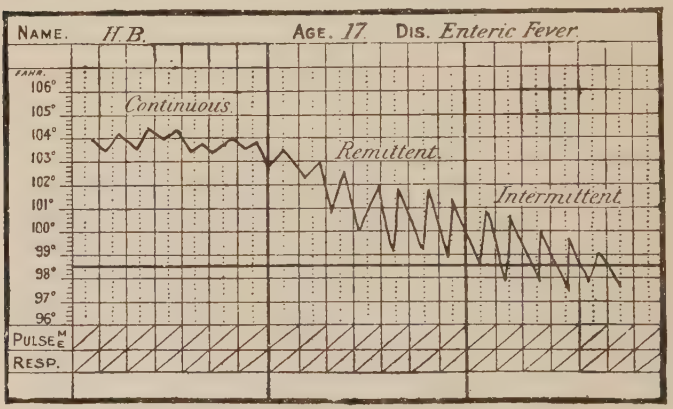
This daily rise and fall are also present in disease. In enteric fever, for instance, the temperature at 2 A.M. is always lower than that taken at 6 P.M., there being often as much as 2° or 3° difference between the two readings. This is merely an exaggeration of the normal rise and fall which in health takes place at these hours. In rare cases we have what is called the *inverse type of temperature*—*i.e.*, it is highest at 2 A.M. and lowest at 6 P.M. This is uncommon, but occurs sometimes, especially in tuberculosis.

Further, not only does the temperature vary with the time of day, but it also varies slightly with the part of the body where it is taken. The surface of the body is naturally cooler than the interior, since heat is constantly escap-

ing from it. The temperature, therefore, of the armpit and groin is lower than that of the mouth, which, again, is lower than that of the rectum. The difference is not great, the bowel being barely 1° hotter than the skin.

2. **In Disease.**—In disease the temperature of the body may be above or below normal, the former being much the more common.

(*a*) **Pyrexia.**—Anybody whose temperature is higher than the normal is said to be suffering from pyrexia. *Fever*



Temperature Chart.

is by many people used in the same sense, though others mean by it both the pyrexia and the accompanying constitutional disturbance.

If the temperature does not rise above 102°, the patient is said to be suffering from moderate pyrexia; if it reaches 104° or 105°, there is said to be severe pyrexia; while if it reaches 106°, the condition is designated as *hyperpyrexia*, or excessive pyrexia, and is one of great danger. By some 105° is considered hyperpyrexial. To put it in other words, 102° is a moderate degree of fever, 104° a high temperature, and 106° hyperpyrexia.

Varieties.—A continuous fever is one in which the tem-

perature keeps constantly at about the same level—*e.g.*, in acute pneumonia.

A remittent fever is one in which there is a marked difference in height between the evening and morning temperatures, the latter falling 2°, 3°, or 4°, but not reaching normal—*e.g.*, in enteric fever.

An intermittent fever is one in which the morning fall reaches or passes below the normal line—*i.e.*, at some part of the day there is a complete absence of fever—*e.g.*, in malaria—and during the last three or four days of the acute stage of enteric fever.

Termination.—Fever terminates either by *crisis* or by *lysis*. If the former, the temperature falls abruptly, reaching normal in twelve to twenty-four hours, as in acute pneumonia. If the latter, the descent is more gradual, several days elapsing before the temperature reaches normal and remains there. A crisis may be accompanied by profuse sweating or diarrhœa, and sometimes by marked symptoms of collapse.

During convalescence a nurse must be prepared for short, sudden, and often inexplicable spells of pyrexia; for during that period the temperature is very unstable, trifling causes, such as worry or excitement, being often sufficient to make it rise 2° or 3° above the normal. This is especially the case in enteric, though a careful watch must of course be kept for any complication.

(*b*) **Depression of Temperature.**—A temperature that is below 97.5° is called *sub-normal*. When it reaches 95° there is a risk of collapse, though this is by no means a necessary accompaniment, as such a temperature is occasionally seen without any symptoms of prostration. Sub-normal temperatures are most commonly seen in those who are convalescing from one of the specific fevers, such as diphtheria or typhoid. A sub-normal temperature may also be produced by shock or hæmorrhage. It is then a much more serious condition.

Taking the Temperature.—This is done by means of an instrument called a clinical thermometer. Those used

in this country register the temperature according to the Fahrenheit scale. It follows from what has been said that the temperature should always be taken at the same time each day, and in the same place. If the axilla is used one day and the mouth the next, misleading results are likely to be obtained. Having seen that the thermometer is clean, and having carefully shaken the column of mercury down not more than 2° below normal, the nurse may proceed to take the patient's temperature in the axilla, groin, mouth, or rectum.

1 *In the Axilla or Groin.*—When either of these parts is used, it must not have been exposed for washing or dressing for at least half an hour previous to the temperature being taken. Any perspiration having been wiped away, the bulb of the thermometer is carefully placed in position, and the arm brought across the chest and kept there, the patient supporting the elbow with his other hand. If he is too weak, the nurse must support the arm. If the groin is used, the legs should be crossed at the knees. A thermometer is much less likely to be broken by a sudden movement of the patient, and a correct temperature is more likely to be obtained, if the bulb is placed high in the axilla, and the stem laid against the chest, parallel to the arm and between the two. The thermometer should be left in position for from five to ten minutes.

2. *In the Mouth.*—The bulb of the thermometer must be placed *under* the tongue, and the patient told to keep his lips closed until it is taken out again, which should be in from three to five minutes' time. If the lips are not kept closed, cold air will enter and a too low temperature be recorded; this method must therefore be used only in the case of patients who can breathe comfortably through the nose. No cold drinks should be given for ten minutes before the thermometer is used. The temperature must never be taken in the mouth in young children or delirious patients, as they may possibly bite the thermometer in half.

3. *In the Rectum.*—This is the most reliable method.

The rectum must be empty of fæces, the instrument oiled, introduced for 1½ in., and left in position for two minutes. It should be well washed after use.

General.—A nurse should not allow the patient to place the thermometer in position or to remove it, else she cannot be sure that the temperature has been properly taken. The thermometer should be washed in cold water, dipped in a *cold* antiseptic solution, and *lightly* dried before being used for another patient. Thermometers used in taking rectal temperatures should be reserved for that purpose.

The temperature should always at once be taken with another thermometer when an unexpectedly high or low record is obtained, in case a faulty instrument has been used. Hysterical patients and malingerers sometimes produce extraordinarily high temperatures by rubbing the bulb of the thermometer, or placing it near a hot-water bottle. If the nurse has any reason to suspect that such a thing is being done, she should *hold* the instrument in position herself.

Thermometers are expensive, and care must be taken in their use. After washing they should at once be stored in a glass jar, partly filled with sand or teased-out cotton-wool. Some prefer that the jar shall contain carbolic lotion (1 in 40) with a piece of cotton-wool at the bottom.

Charting.—A morning-and-evening chart or a four-hourly one may be used according to the acuteness of the case. In the former, the end of the week is often marked by a thick line, and when starting a chart the space corresponding to the day of the week should therefore be used. Neat dots indicating the temperature should be joined by fine straight lines. In some sanatoria the dots of the morning temperature are joined together, and similarly those of the evening temperature, with a view to displaying more clearly any abnormality in the daily range.

The chart also contains spaces for the recording of pulse, respiration, and actions of the bowels. Aperients and enemata may be charted immediately below the top

line ; similarly, sleeping draughts or injections above the temperature, and the weight in a corresponding position each week ; menstruation may be indicated by M.

IV. The Urine.

A healthy adult will pass on an average about 2½ pints of urine in the twenty-four hours. The amount varies with the temperature of the surrounding air, and consequent increased or diminished activity of the skin. There is a certain quantity of water to be removed from the system each day. If the skin uses much of it in the making of sweat there will be less for the kidneys. When much fluid is taken, more urine will be passed. Urine is an excretion of great importance, since dissolved in the water are certain poisonous substances produced by the working of the different organs, which, if left in the system, would quickly kill the patient.

In health, urine is clear when passed, of a light amber colour, slightly acid, often changing to faintly alkaline after a meal, with a specific gravity varying between 1015 and 1020.

In disease, there may be great changes in the character of the urine. The quantity passed may rise to 20 pints per day, or be only a few drachms ; the colour may be almost quite black, or it may look like water ; the specific gravity may be as low as 1002 or as high as 1060, and the reaction may be strongly and persistently alkaline.

Suppression of Urine is a most serious and frequently fatal symptom. It results from a complete failure on the part of the kidneys to do their work. The patient passes no urine at all, the bladder being quite empty. The poisonous waste substances which should have been removed by the renal organs accumulate in the system, and quickly produce a most dangerous form of blood-poisoning called *uræmia*. Suppression of urine is most common in acute inflammation of the kidneys. It is also seen during the last

hours of life in severe diphtheria and cholera. More often there is a partial suppression, a few drachms or an ounce or two of highly-coloured urine being passed in the twenty-four hours.

Suppression may also result from blocking of the ureters by stones, so that no urine can pass from the kidneys to the bladder. Such cases do not present the symptoms of uræmia which so frequently appear when suppression is caused by inflammation of the kidneys.

Retention of Urine is much less serious than suppression. Urine is being secreted by the kidneys, but, owing to the patient's inability to void it, is accumulating in the bladder, which may in consequence be greatly distended.

Retention may be due to stricture of the urethra, or paralysis of the bladder; or it may be caused by a dulling of the senses in cases of typhoid and in shock after severe accidents; or it may follow an operation on hæmorrhoids or hernia. It is a condition for which nurses should always watch, especially in fever patients, and at once report.

Incontinence of Urine.—In this condition there is inability to retain the urine within the bladder (see p. 272). There may be *simple incontinence*, as is seen in cases of disease of the spinal cord; or there may be *overflow incontinence*, the bladder being extremely distended with an occasional escape of urine; or there may be *reflex incontinence*, the bladder emptying every few hours without the patient's volition; or there may be the *incontinence of childhood*, known as "enuresis," due to irritability of the bladder, worms, or faulty education of the child.

Measuring Urine.—In certain conditions, such as inflammation of the kidneys, or when less urine than normal is being passed as may happen in diphtheria or heart disease, the nurse is required to measure the total amount voided during the twenty-four hours, and record the same. This precaution is also advisable when *digitalis* is being taken, a diminution in the quantity of urine passed being often an indication of over-dosage by this drug. To ensure obtaining all that is excreted during that time and no

more, she should make the patient empty his bladder immediately before she starts measuring, because the urine that is then in the bladder belongs to the preceding twenty-four hours. For the same reason, when the twenty-four hours come to an end she should again make him empty his bladder, and add the urine then passed to what she has collected. If during the day any is lost through the patient passing it into the bed, the nurse should put the sign + after the number of ounces she records, as indicating that the patient has passed more than that amount.

Both the vessels into which the urine is passed, and also those in which specimens are put up for examination by testing, must be kept scrupulously clean. If soda is used to cleanse the vessels, they must be thoroughly rinsed with water afterwards, or the next urine that is placed in them will be rendered alkaline.

Colour varies to a certain extent with the quantity passed: the more concentrated the urine, the higher its colour. Red or smoky urine indicates the presence of *blood*, which is also shown by the chocolate-coloured deposit which settles on standing. It is present in acute inflammation of the kidneys.

Dark olive-green urine is caused by the absorption of *carbolic acid*. It is not infrequently due to the use of carbolic acid fomentations in young children, and should be at once reported. It must not be confounded with smoky urine, which at first sight it closely resembles.

Bile gives to urine a deep yellow-ochre tinge, a somewhat similar colour being produced by the internal administration of rhubarb.

Deposit.—A nurse should always notice whether the urine is clear when passed, and only becomes turbid on standing (*urates*). A light-pink or salmon-coloured deposit has no evil significance; it also consists of urates, is the usual accompaniment of a high temperature, and is of frequent occurrence in people who are in perfect health. It appears when the urine has become cold, and disappears if it is heated.

Uric acid forms a scanty but characteristic deposit resembling fine red dust or sand.

Phosphates form a white feathery deposit, generally in pale urine. It is insoluble by heat, but soluble in acetic acid.

Oxalates may be recognised by their bright crystalline character.

Blood gives rise to the chocolate-coloured sediment already mentioned.

Pus produces a milk-white deposit at the bottom of the specimen-glass.

Mucus produces a light flocculent deposit or cloud. It is frequently present in health.

Reaction of Urine.—In health, urine is acid for the greater part of the twenty-four hours—*i.e.*, it turns blue litmus-paper red. For a short time after meals it may be slightly alkaline, the change being due to certain elements in the food. For this reason the urine that is collected for examination should be that which is passed in the early morning before breakfast. Urine may change slightly the colour of both red and blue litmus, or it may be neutral in reaction and hence affect neither.

In some fevers urine is rather more strongly acid than usual, but the only important change in disease is a marked alkaline reaction, accompanied by an offensive ammoniacal odour. This indicates decomposition of the urine in the bladder. It is not infrequently due to the use of an imperfectly cleansed catheter. If not quickly checked, it will set up *cystitis*—*i.e.*, inflammation of the bladder. The reaction of the urine should always be tested by the nurse as soon as it is passed, for stale urine tends to become alkaline.

Specific Gravity.—The specific gravity of a fluid is its weight as compared with that of water. When we say that urine has a specific gravity of 1015, we mean that whereas a certain quantity of water weighs 1000 grains, an equal quantity of urine would weigh 1015 grains.

The *urinometer* should float standing clear of the sides and

bottom of the specimen glass. The number should be read with the eye on a level with the surface of the urine. A low specific gravity suggests kidney disease, or it may be only temporary. A high specific gravity with pale urine suggests diabetes mellitus.

Albumin is what a nurse is most often asked to test for. It is very frequently a symptom of inflammation of the kidneys, but is also present in the urine in various other conditions, such as heart disease and extreme anæmia, also when the working of the kidneys is disturbed by a high temperature. Various tests are used for albumin, but they all depend upon the fact that that substance *is coagulated by heat or various chemical reagents,* and then appears as a cloud in the fluid which contains it. An example of this is seen in the case of white of egg, which consists of pure albumin. Boiling coagulates it, converting it from a transparent liquid into an opaque white solid.

In examining a urine for albumin, the nurse should proceed as follows :—

She first determines the specific gravity of the specimen by means of a *urinometer*. She next tests it with *litmus-paper* to see whether it is acid or alkaline. She then proceeds to coagulate the albumin, if it is present, by heat, or nitric acid, or picric acid.

In order that one may see clearly any cloud that forms in the process of testing for albumin, any sediment should not be disturbed so that the urine may, to start with, be quite clear. In many cases it is so ; in others the cloudiness is due to *urates,* which disappear when the fluid is gently warmed. Sometimes, however, the urine is somewhat opaque, owing to the presence of *mucus.* The only way to get rid of this is to strain the urine through a filter paper fitted into a small glass funnel. Having now obtained a perfectly clear urine, the nurse proceeds to test it in one of the three ways mentioned :—

1. *The Heat Test.*—A clean test-tube is filled three parts full of urine. If the fluid is alkaline or neutral, two drops of dilute acetic acid are added to it. The upper-

most part of the column of urine is then held in the flame till it boils. While doing this, the test-tube is held by the lower end in a slanting direction, with the other end pointing away from the nurse, lest the urine should spurt. While heating it, she should move the test-tube round and round so that the sides may be kept wet, or they will be cracked by the heat. By boiling the upper part of the fluid only, one is able to compare the upper portion, if it becomes cloudy, with the clear unboiled part below. This is often of great use when only a small quantity of albumin is present.

If no cloud appears on boiling, albumin is absent. Since pus and blood contain albumin, it may be assumed that they are absent also.

If a cloud does appear on boiling, *but not otherwise,* a few drops of acetic acid should be added. Should the cloud persist, it is formed by *albumin ;* if the acid causes it to disappear, it consists of salts called *phosphates.*

The reason why it is not advisable to add acetic acid unless it is essential (as in rendering alkaline or neutral urine acid, and in differentiating between albumin and phosphates) is that there is in some urines, especially the highly-coloured ones, a substance of no importance, called *nucleo-albumin,* which forms a cloud with acetic acid (also with picric and nitric acids), although one is not produced by heat. The nurse should avoid wrongly reporting this as albumin.

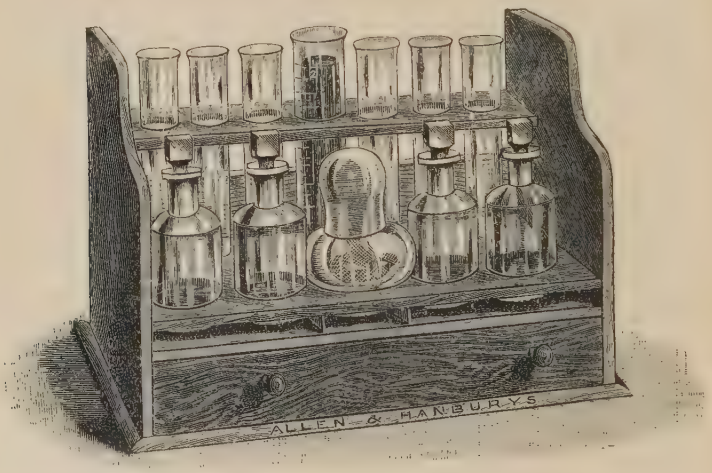
2. *The Nitric Acid Test.*—A small quantity of strong nitric acid is placed in a test-tube, which is then held slantwise while the urine is allowed to trickle slowly down the side. Being lighter than the acid, it floats on it. If albumin is present in the urine, a white ring will appear at the point where the two fluids meet.

3. *The Picric Acid Test.*—If picric acid is floated on the urine, a ring forms at the junction of the two fluids in albuminuria.

Sugar is present in the disease known as diabetes mellitus. The easiest and most usual *test* for its presence in

urine is to take about a teaspoonful of Fehling's solution (which contains sulphate of copper, caustic soda, and tartrate of potash), boil it in a test-tube, and then add very gradually an equal bulk of urine. An orange-red deposit, which persists on boiling, indicates the presence of sugar.

Blood may appear in the urine (*hæmaturia*) as a symptom of acute inflammation of the kidneys; or it may be due to stone in the kidneys, to stone or growth in the bladder, or to injury of some part of the urinary tract. In acute



Urine Test Stand.

nephritis the urine is "smoky" in colour when passed, and shows a reddish-brown deposit on standing.

In *testing*, two or three drops of tincture of guaiacum are added to a drachm of urine, and, after this has been well shaken, half a drachm of ozonic ether is floated on the surface. If blood is present, a blue ring will appear at the junction of the two fluids. The reagents should be fresh. If the quantity of blood is small, it is well to use a pipette and obtain for examination the lowest stratum of urine, as this naturally contains a larger proportion of the red cells.

Bile is found in jaundice (for causes, see p. 274). *To test,* run a few drops of urine from a pipette on to a white dish, and beside them place a few drops of strong nitric acid. Make them run together; at the point of meeting there will be a play of colours, of which *one must be green.*

Pus is found in some inflammatory diseases of the urinary tract (urethritis, cystitis, pyelitis, renal abscess); it may be due to gonorrhœa, leucorrhœa, stone in kidney or bladder, or renal tuberculosis. *To test,* pour the fluid away (or use pipette), and to the deposit add an equal quantity of liquor potassæ and shake up; if pus is present, it will become ropy; mucus will not.



Urinometer.

Ketones (*Acetone* and *Diacetic Acid*) are found in the urine in any condition causing acidosis or ketosis—*e.g.*, fasting (especially an insufficient supply of carbohydrates, which leads to incomplete metabolism of fats), severe diabetes, delayed chloroform poisoning, and pneumonia.

Rothera's Test for Acetone and Diacetic Acid.—To about 10 c.c. urine in a test-tube add about a teaspoonful of crystals of ammonium sulphate, and shake thoroughly. Add five drops of freshly prepared 5 per cent solution of sodium nitro-prusside, followed by 2 c.c. of concentrated ammonia. Mix and allow to stand for at least thirty minutes. A characteristic violet colour indicates the presence of acetone or diacetic acid.

Gerhardt's Test for Diacetic Acid.—To one inch of urine in a test-tube add liquor ferri perchloridi drop by drop till no further precipitate is formed. Filter. To the filtrate add some more liquor ferri perchloridi. A claret red colour indicates the presence of diacetic acid. (It is not essential to filter except in doubtful cases.)

CHAPTER VI.

BANDAGES, SPLINTS, AND EXTENSION.

I. Bandaging.

Bandages are usually made of cotton ; linen and calico are also used, but are less elastic. For special purposes gauze and domette, which is a variety of soft elastic flannel, are employed. Crêpe bandages are light elastic cotton bandages, which can be stretched out to more than double their length ; they are used for varicose veins. Elastic webbing is made of rubber longitudinally and cotton transversely ; it is used to give support to a joint or varicose veins. Martin's elastic bandage is of thin rubber sheeting, and is used chiefly with a tourniquet.

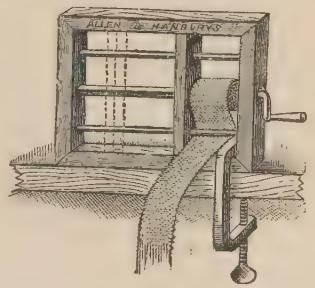
Roller bandages are usually 4 or 6 yds. long, and vary in width from $\frac{3}{4}$ to $4\frac{1}{2}$ in. or more according to the part to be bandaged. They are generally bought ready-made. If they are to be made from material, this should be snipped at appropriate distances, and torn in its whole length into strips ; the loose threads at the edges should then be removed, and the strips tightly rolled into bandages with the aid of a bandage winder. The rolled part of a bandage is called the " head," and the loose end the " tail."

The Limbs.—From the point of view of bandaging, a limb may be divided up into cones, the junctions of cones, and short cylinders. Thus, the bases of two cones meet at the knuckles, one with its apex at the finger-tips, and

the other with its apex at the wrist. Just above the wrist is a short cylinder, and then comes the cone of the forearm. At the elbow the apices of two cones meet, one being the upper part of the forearm, and the other extending from the middle of the upper arm. Above the latter is another short cylinder.

Bandaging.—As a rule, the simple spiral bandage is employed for a cylindrical part; for a cone, the reverse spiral is used; while at the junction of two cones a figure-of-eight is best. By a combination of these methods a bandage can be got to sit evenly and with equal pressure.

In the *reverse spiral* the bandage is folded over on itself at regular intervals, so that no spaces are left uncovered between the turns. To make a reverse, fix the part of the bandage already applied with a finger of the left hand, allow the next 3 in. to be quite loose, turn the roller over, at the same time allowing the loose part to fall into position, and then pull taut. A *figure-of-eight* consists of two circular turns, one above and one below the point of crossing. For the shoulder and groin a variety of figure-of-eight, known as the *spica*, is used; in it one of the circular turns is larger than the other. A figure-of-eight is "divergent" when the first turn crosses the most prominent part and the succeeding turns diverge from it; it is "convergent" when the successive turns converge to the centre of the part to be bandaged. A convergent spica fixes better than a divergent one.



Adjustable Bandage Winder.

The following comprise the principal *rules of bandaging*:—

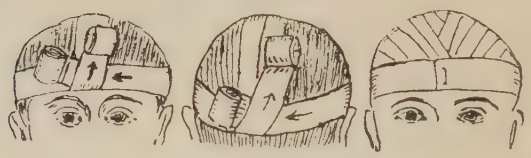
(*a*) Wash and powder the limb. Two surfaces of skin should not be allowed to be in apposition; absorbent wool should be placed between.

(*b*) The bandage should first be securely fixed by a couple of turns round the limb.

(*c*) It should be applied from below upwards, and from within outwards, passing over the front of the limb ; each turn should overlap two-thirds of the preceding turn ; the margins should be kept parallel, and equal pressure applied throughout.

(*d*) Finally, the end should be secured with a safety-pin or by stitching, the latter being preferable in the case of children. If there is risk of a bandage becoming loose, as, for instance, when it passes over the back of a foot-splint, it should be tacked in several lines along the length of the limb, especially at the back.

Special Bandages.—(1) *The Capelline.* Take two rollers, sew the ends together, and wind so that one, the



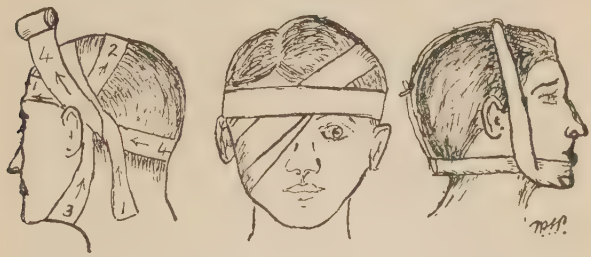
Capelline Bandage.

"horizontal" bandage, is a third larger than the other, the "vertical" bandage. Stand behind the patient with a bandage in each hand ; carry them in opposite directions round above the eyebrows and below the occipital protuberance. At the back pass the shorter bandage beneath the horizontal one, and then carry it forwards and backwards over the hand, fixing it by running the horizontal bandage over it each time it reaches the front or the back, the vertical bandage gradually diverging until the scalp is covered. It is an uncomfortable bandage, and is rarely used.

(2) *Spica for the Head.*—Hold a loose tail, about 12 in. long, behind the ear in the left hand, standing behind the patient ; carry the bandage horizontally round the head,

and, when *below* the loose tail, swing it up over the crown, and down in front of the other ear under the chin to the starting-point. This fixes the bandage, and a divergent spica can now be started. Pass the bandage behind the loose tail, and swing forwards over the centre of the area to be covered, then go below the occiput and the loose tail. Repeat this, diverging until the area is completely covered. Finally knot or pin the ends.

(3) *For the Mastoid.*—Place the tail on the forehead; pass horizontally above the sound ear, below the occiput, and over the upper part of the mastoid dressing. Repeat, gradually covering more of the dressing, and using a re-



Spica for the Head. *Eye Bandage.* *Jaw Bandage.*

verse each time to bring the bandage into a horizontal position when travelling over the forehead and above the sound ear. Finish with a horizontal turn.

(4) *For the Eye.*—Fix with two horizontal turns in the direction of the sound eye over the eyebrows and below the occiput; then pass below the ear, and obliquely up across the affected eye; then across the side and down the back of the head, and again up over the eye; finally, fix with another horizontal turn.

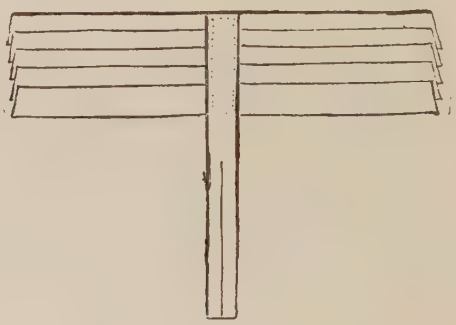
(5) *For the Jaw.*—A four-tailed bandage is used, made by splitting a bandage (3 in. wide and a yard long) except for about 4 in. in the middle. A short tear for the chin is made in the unsplit part; the two anterior tails are tied

at the occiput, and the two posterior ones over the crown, all the ends being finally tied together to prevent slipping.

(6) *For the Side of the Neck.*—A figure-of-eight round the neck and head may be used, and the lower end of the dressing secured by a couple of turns under the axilla.

(7) *For the Back of the Neck.*—A figure-of-eight round the forehead and neck, covering the occiput and back of neck forms a convenient bandage. It is useful in cases of carbuncle.

(8) *For the Breast.*—Fix with two turns round the waist; then pass under the affected breast, over the opposite



Many-tailed Abdominal Binder.

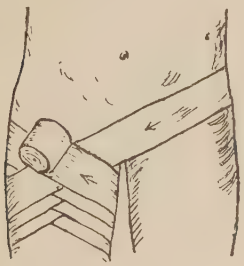
shoulder, down across the back, and then to the front at a slightly higher level than previous turns. Repeat several times, gradually ascending.

(9) *For the Abdomen.*—A many-tailed bandage is generally used, preferably with perineal pieces. The bandage consists of a central strip of domette or flannelette, to which five or six strips, 4 in. wide and $1\frac{1}{2}$ yd. long, are stitched at right angles, each overlapping the previous one by two-thirds of its width.

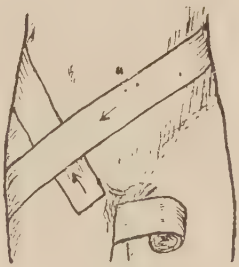
(10) *For the Perineum.*—A T-bandage is used, made by sewing two strips together. The horizontal strip is tied round the pelvis; the vertical strip passes behind the

sacrum, and forward between the thighs, being split to accommodate the scrotum ; it is tied in front to the horizontal strip.

(11) *For a Stump.*—Fix by a couple of turns about 5 in. from the end of the stump ; then bandage at right angles to these from front to back and back to front, fixing the angles by the fingers and thumb of the left hand ; gradually diverge until the stump is covered ; then fix by circular turns. A sling round the waist, to which this bandage can be attached, is useful to prevent it slipping off ; or the bandage may be carried above the next joint.



Ascending Hip Spica.



Descending Hip Spica.

(12) *Spica for Hip and Groin.*—If it is desired to exert pressure from below upwards, apply an ascending spica ; if from above downwards, a descending spica. Use a pelvic rest, and slightly flex the knee.

For the ascending spica, fix with two spiral turns round the thigh from within outwards, then two reverses ; then carry across the front of the groin outwards, returning across the back to the front of the groin. Continue these turns, gradually working upwards.

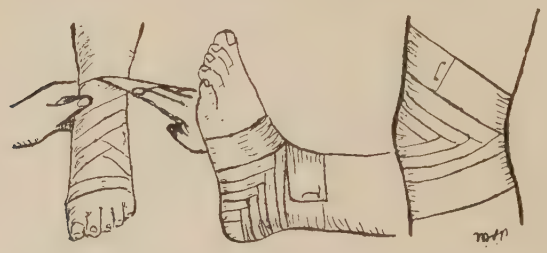
For the descending spica, place the free end in the groin, pass up towards the affected side, and go round across the loins, and then obliquely across the abdomen to pass over the free end ; then go round the thigh and across the groin, overlapping the first turn. Repeat until covered.

(13) *Thigh.*—Fix with a turn above the knee, and apply a reverse spiral or a figure-of-eight.

(14) *Knee.*—Begin with a spiral turn below the knee, and let the middle of the next turn rest on the point of the knee; then apply a figure-of-eight, working above and below that centre. The figure-of-eight should be divergent if slight movement is allowable; convergent, if fixation is required.

(15) *Leg.*—Fix by a figure-of-eight round the ankle, omitting the heel; then use a spiral, followed by a reverse spiral.

(16) *Foot.*—Fix by a figure-of-eight round the ankle, then apply spirals and reverse spirals on the foot.



Foot and Leg Bandage; reversing started. *Spica of Heel.* *Knee Bandage.*

(17) *Heel.*—Fix with a spiral turn round the ankle; then apply a turn so that the point of the heel rests in the centre of the bandage; then go across the front of the instep and back round to the heel; then apply alternate turns round the heel and the top of the foot, working from the centre of the heel; finish by a spiral round the ankle.

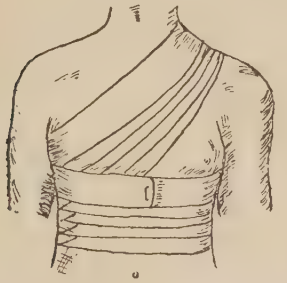
(18) *Great Toe.*—Fix round the ankle; then apply a convergent spica round toe and ankle.

(19) *Shoulder.*—Put pads in both axillæ and powder with boric acid; two bandages may be necessary. Fix by two spiral turns round the upper arm on the affected side; then apply two reverses; then go across the back and under the other arm about 4 in. below the armpit,

then across the front of the chest and over the shoulder in a line with the reverses, then under the arm from behind forwards, up over the shoulder, and across the back again. Repeat until covered.

(20) *Elbow.*—Fix by a spiral just below the elbow; then carry the bandage so that the olecranon lies in the middle of it; continue by figure-of-eight turns, working above and below the olecranon. Finish by a spiral above the joint. The elbow should be flexed before commencing.

(21) *Hand and Forearm.*—Fix by a spiral round the wrist; then carry the bandage across the back of the hand to the root of the little finger and across the palm, then



Breast Bandage.



Spica for Shoulder.

across the back of the hand again to the wrist; apply a figure-of-eight round knuckles and wrist, then a couple of spirals around the lower forearm, and reverse spirals as far as the elbow.

(22) *Finger.*—Begin and finish by a turn round the wrist; the palm must be left clear; use spiral turns.

(23) *Thumb.*—Begin with a turn round the wrist; carry the bandage across the back of the thumb between it and the first finger; take it round the thumb to near the tip, then across the back of the hand and under the wrist, and again round the thumb, covering two-thirds of the previous turn; repeat until covered. Finish by a turn round the wrist; split the ends and tie.

Triangular Bandages are useful in emergencies, and are largely used in military surgery. In civil surgery they are often employed as slings. They are sometimes used to fix dressings to the hip or buttock, two being required for this purpose. One is folded and tied round the pelvis (not the waist) as a belt, with the knot on the affected side. The other is laid on the hip with the apex upwards; the apex is passed beneath the knot of the belt and drawn through for 4 in.: the lower border is turned inwards for 2 in., the ends gathered up and passed horizontally round the thigh, and again brought round 1 in.



Triangular Bandage applied to Hip, and used as an Arm Sling.

above the lower edge of the bandage, and tied on the outer aspect of the thigh. The apex, having been pulled so that the bandage is smooth, is turned down over the knot and pinned to the other bandage. If the posterior part of the hip has to be covered, the knot is placed farther back; if the groin, farther forward.

II. Splints.

A splint may serve merely to fix a joint or the fragments of a fractured bone; or it may combine fixation with extension, as in the Hodgen and the Thomas bed-splint.

Fixation splints may be made of flat board cut to a suitable length and width; or they may be moulded in wood or metal to the shape of a particular part of the body, these being naturally more comfortable. Sometimes stout wire-netting or Gooch splinting is used. The latter consists of narrow strips of wood glued to a backing of canvas, and has the advantage that it can adapt itself to the cylindrical shape of a part, being flexible in one direction and rigid in the other. To reduce the risk of pressure-sores, splints may be made with holes for the heel, malleoli, or condyles. "Angular" splints, with or without a hinge at the elbow, are useful in various injuries of the arm. "Interrupted" splints are often necessary in compound fractures, or after excision of a joint; they are best made by fitting a wooden splint to the limb, fastening on the iron junction in the appropriate position, and then sawing away the part which requires to be removed.

The Padding of Splints.—The best material for this purpose is probably well-pulled tow, which may be covered with a thin layer of brown wool Tow, when properly manipulated, provides an even pressure with a certain amount of spring in it. The padding is kept in position by a layer of linen or calico, which is stitched round the back of the splint. If necessary it should be covered with jaconet to keep it dry and clean. The pad should be large enough to overlap and cover all sharp edges and points of the splint, and should be from three-quarters to an inch in thickness.

Application of Splints.—Splints are usually secured by straps and buckles passing over pads of gamgee tissue; they can then be readily adjusted as the swelling of a limb decreases, and be easily removed for massage. A bandage may be applied over them. Before the splints are applied the limb should be washed, dried, and powdered; the pads should also be freely dusted with powdered boric acid, especially in the neighbourhood of the feet. Care should be taken that there is no pressure on bony prominences. Thus, small pads should be arranged above and

below the malleolus, and under the ankle for the heel. A ward should always be provided with these pads, round, square, and oval, from 2 to 3 in. in diameter, 1 to 1½ in. thick, stuffed with tow. There ought also to be a supply of toe-caps, made of gamgee tissue or loosely-knitted thick wool, which should be double. These are often needed to keep the toes warm.

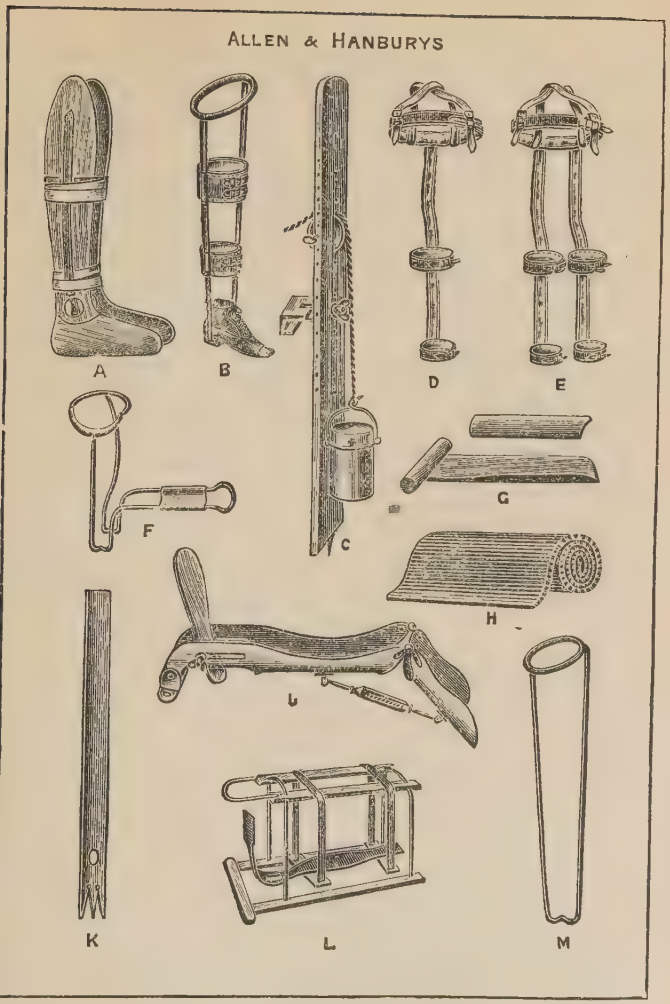
Of special **Wooden Splints** the best known are *Carr's* splint for Colles's fracture of the lower end of the radius; *Cline's* splints for fractured tibia and fibula; and *Liston's* splint, which is often applied to the sound lower limb when extension is applied to the other, in the treatment of fractured femur or tuberculous hip.

Of **Iron Splints** the following are the most useful :—

1. *Neville's Splint* is often used with a pair of Cline's or simple side splints, thus forming a "box splint," which is suspended by leather straps from a swing cradle. This is a common method of treating fractures of the tibia and fibula.

2. *The Macintyre Splint* is used for the knee and leg. It has shaped leg and thigh pieces, the joint between which is adjustable as to its angle by means of a rack and pinion. The foot piece is movable, and has a stud to which a stocking can be attached, drawing the heel forward and thus preventing a pressure sore. When used for a fracture, the foot and thigh are firmly fixed to it by bandage or strapping; extension is made until the fracture is reduced, and then the footpiece is clamped in the lateral slots, and the whole limb bandaged to the splint.

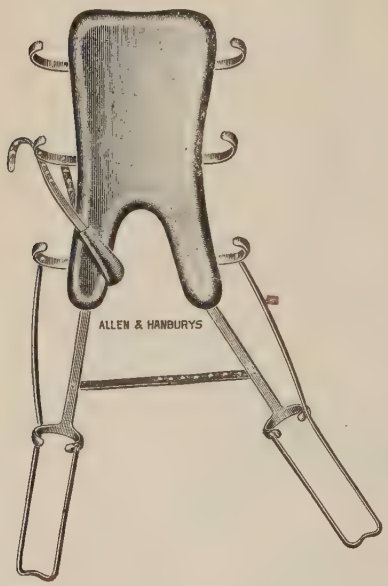
3. *The Hodgen Splint* (p. 126) is devised to apply extension in the flexed position of the limb in cases of fracture of the femur, especially at the upper and lower ends of the shaft. It consists of a wire frame, shaped to fit the limb and bent at the knee, with four hooks on its upper surface. It extends from Poupart's ligament to 6 in. below the foot. The limb is suspended from the frame by strips of flannel, fixed with safety-pins to its sides. An anæsthetic is given, and a strapping extension is applied to the limb as high



Splints.

A. Cline's Leg Splint. B. Thomas's Knee Caliper Splint. C. Extension Apparatus. D. Thomas's Single Hip Splint. E. Thomas's Double Hip Splint. F. Jones's Humerus Extension Apparatus. G. Carr's Splint. H. Gooch's Splinting. J. Macintyre's Splint. K. Liston's Thigh Splint. L. Fracture Cradle with Neville's Splint. M. Thomas's Bed Splint for Knee or Femur.

as the seat of fracture; the wire frame is held over the limb, and the flannel strips passed under and pinned, thus forming a trough for it; the cord of the extension is tied to the lower cross-bar of the splint. Cords are then attached to the hooks, and from them another cord passes over a pulley in a wooden upright or a Balkan frame. This is pulled until the leg is raised a foot from the bed, and fastened.



Jones's Abduction Frame, with perineal strap.

4. *Jones's Abduction Frame* is used in fracture of the femur and tuberculous disease of the hip. It extends from the scapulæ to a few inches beyond the soles, and consists essentially of two bars of iron, joined by transverse hoops. The bar on the affected side is jointed opposite the hip. The patient lies on a thickly-padded leather "saddle," the buttocks resting over a gap in its lower part; the transverse hoops are moulded round the body; an extension is applied to the affected limb, the cord being tied to the V at the end of the leg piece. Counter-extension is obtained by a padded perineal strap applied to the other groin, and an extension is also attached to the normal limb. The perineal strap should be kept tight, except that several times a day it may be loosened to attend to the skin beneath. The patient is never taken off the splint; the back is treated by working a piece of soaped bandage between it and the saddle, and only the exposed skin is washed. Pads should be placed under

the knees to keep them slightly flexed ; the feet should be kept at right angles, and protected from the weight of the bed-clothes. The jointed bar is gradually moved outwards until the limb is well abducted.

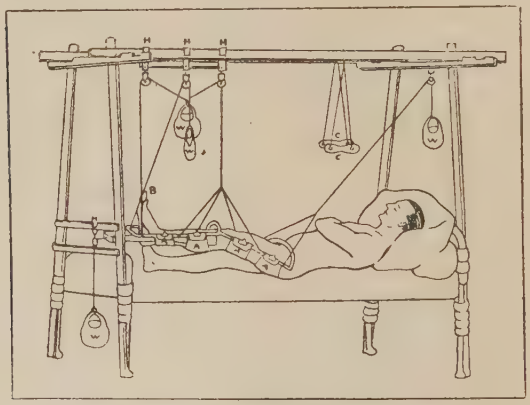
The *Double Thomas Hip Splint*, used for hip disease, is similar, except that there is no joint at the hip, no saddle, and no arrangement for extension. The *Single Thomas Hip Splint*, used with a patten on the boot on the sound side, is not satisfactory, and to a great extent has been replaced by spica splints, made of celluloid or leather.

5. *Thomas's Knee Splint* consists of an obliquely placed padded ring, on which the ischial tuberosity rests in standing, and two iron rods, which are adjustable in length and either end below in a ring shaped like a patten, or are bent inwards to fit into a small tube imbedded transversely in the heel of the boot. In the former case, the child wears a patten on the boot of the sound limb. In the other case, the splint is called a "caliper," and is made so long that the patient's heel is a good inch from the sole of the boot, the heel of the boot on the sound limb being thickened to equalise the length of the limbs. Transverse leather bands and a knee-cap maintain the limb in position in the splint.

6. *Thomas's Bed Splint* is used in the treatment of fractures of the femur and affections of the knee-joint. It is similar to the last, except that it ends below in a V-shaped notch over which extension bands may be tied. Transverse flannel strips, pinned to the bars, form a trough for the limb to lie in, and an extension is applied, the ring being pushed firmly up against the ischial tuberosity. To prevent a pressure sore, the nurse must frequently clean the ring by working a strip of soaped bandage transversely round it, while the skin must be kept dry and powdered. The foot end of the splint should be supported to prevent sores forming on the heel. If the Thomas bed splint is suspended like a Hodgen's splint to a wooden upright or a Balkan frame, the risk of sores both at heel and buttock is eliminated. In cases of fractured femur, the splint is bent at the knee.

7. *Jones's Humerus Extension Splints* are modifications of the Thomas bed splint used in the treatment of fracture of the humerus. They may be straight, or bent at right angles at the elbow. If the former, the patient stays in bed, and a weight and pulley extension is applied to the lower part of the upper arm; if the latter, the patient can sit up and the weight of the limb is usually sufficient to maintain extension.

A Balkan Frame consists of four vertical posts,



Balkan Frame and Hodgen Splint, as used in Fracture of Femur (after Blake).

6½ ft. high, strapped to the corners of the bed and supporting a horizontal frame; to this suspension-pulleys can be attached, allowing a pull in any direction. The horizontal bars have deep notches which allow of their being adjusted as required, at the same time ensuring rigidity of the whole. The pulleys supporting the limb may be attached to a trolley running under one of the horizontal bars, and by means of cords and weight-cans a well-balanced suspension can thus be obtained, which allows considerable movement without any risk of disturbance of the injured part. The frame is a useful adjunct in

the use of the Hodgen or Thomas bed splint in cases of fracture of the femur.

Casings are applied especially when fixation is required to be absolute, as after certain operations on joints or deformities, or in positions where ordinary splints would be inconvenient or unsuitable. The material commonly used is plaster of Paris, occasionally gum and chalk, or water-glass. Gutta-percha sheeting and poroplastic felt, cut to shape according to a paper pattern, and softened by soaking in hot water or steam, are also used sometimes.

Plaster Bandages.—The bandage material is a crinoline, sized with starch and not with glue. It is torn into 4-yard lengths in widths of 3 or 4 in.; each strip is then folded on itself and the ravellings removed by a pin. The bandage is placed flat on the table; a handful of plaster is laid on it, and pushed along over it with the hand, thus removing the excess. While this is being done, the bandage is rolled loosely. The bandages should be kept in a tin box in a dry place. For use they are set in a bowl of warm water, to which a teaspoonful of salt may be added if quick setting is desired. When all the bubbles have escaped and they are thoroughly saturated, they are squeezed between the hands, one placed at each end to prevent the escape of plaster.

Plaster bandages are sometimes applied over stockinette, in which case the moulding must be very carefully done around bony prominences; or more usually over wadding —*i.e.*, cotton wool dressed on one side to enable it to be cut and rolled into bandage form. The plaster bandage is applied by circular turns, or by a figure-of-eight; pleats taken in the lower edge will enable it to lie evenly. It should be smoothed by the hand with each application.

If it is intended to make the plaster removable, pieces of blind-cord should be laid under the bandage in the line of the proposed sections. As the plaster approaches setting, it is cut with a sharp knife; the cord if pulled on will be found to assist considerably in cutting to the right depth.

A "Bavarian" splint consists of two layers of house

flannel cut to the shape of the limb, and sewn together behind; the inner one is stitched over the front of the leg and foot, plaster paste is rubbed in, and then the outer layer superimposed. In a "Croft's" splint, two layers of house flannel, similarly cut, are soaked in plaster paste, then sandwiched between layers of lint, and bandaged to each side of the limb. On the next day these splints are cut down the front, the edges bound with strapping, and a bandage applied.

III. Extension.

Weight extension is used especially in fractures of the thigh and disease of the hip and knee joints. The traction may be applied through the skin of thigh and leg, or, by means of "icetong" calipers (p 574), directly to the bone —*e.g.*, the femoral condyles or the os calcis.

When through the skin, it may be applied by means of strapping, or of Sinclair's glue (glue 50, water 50, glycerine 2, calcium chloride 2, and thymol 1 part). The latter had a considerable vogue during the war, but it is very liable to cause soreness of the skin, especially in children. It is painted over the skin, brushing all the hairs in an upward direction; flannel strips with webbing attached are then rapidly applied to it.

The usual method of applying extension is by strapping, either Mead's or, preferably, moleskin. If moleskin strapping is used, two pieces are cut, either in strips 2 to 3 in. wide or shaped so as to cover as wide an area of skin as possible. The lower part is folded on itself, partly to strengthen it, and partly to have a non-adherent surface next the ankle. To it webbing straps are sewn in such a way as to get an extensive grip of the strapping, which otherwise might tear when a heavy weight was applied. The strapping is applied to the skin on either side of the limb without wrinkles, being notched at the edges to prevent these; and a bandage is firmly applied over it. A narrow spiral of strapping may be used to assist in its

fixation. The skin should have been cleaned, and, if necessary, shaved. Neither the spiral nor the bandage should encircle the limb lower than 2 in. above the malleoli, otherwise a sore may be caused above the heel. The malleoli should be protected by a circle of boric lint, held in position by a few stitches. The strapping is left for a few hours to adhere firmly before the weight is applied. Its webbing straps are then connected with a weight-can by means of a stirrup. The stirrup consists of an oblong piece of wood, slightly wider than the sole, in the centre of which is a hole through which a length of blind-cord



Traction by Suspension in Tuberculosis of the Hip Joint.

passes, being prevented by a knot from being pulled through. The stirrup has fixed to it a piece of webbing with two buckles, to take the webbing straps of the extension. The weight applied should generally not exceed three-quarters of a pound for each year of age in the case of children. A cradle is required, and the foot of the bed should be raised if necessary. In hip disease it is usual, when the limb has been brought into good position, to reduce the weight, and to carry the strapping from the groin to just above the knee only, to avoid risk of stretching the ligaments of the latter.

Traction by suspension proves successful in tuberculosis of the hip and fracture of the femur. In its simplest form, the mattress, resting for its whole length on a fracture

board, is raised at one end to the level of the top rail of the bedstead head, and the cord of a strapping extension, applied to the thigh, or thigh and leg, of the affected limb, is tied to the rail. The weight extending the joint is thus the patient's body. As may be seen in the illustration, slight flexion of the knee is secured by the insertion of a wooden bar under the mattress, and external rotation is prevented by a sandal, to the sole of which a transverse piece of wood is screwed. The strapping extension should consist of two pieces of moleskin plaster, enveloping the thigh and overlapping half an inch front and back. To prevent wrinkling, it is well to substitute for webbing a triangular strap of strong linen, the base of which is sewn to the whole length of the lower border of the moleskin plaster. The plaster is warmed, applied smoothly, and fixed with a water-dressing bandage, a rubber hot-water bottle being wrapped round for a time to assist in producing adhesion. It is sometimes an advantage to wind a tape of boric lint round the limb for the lower edge of the plaster to rest on. During the changing of the strapping traction is kept up by substituting temporarily a flannel bandage tied as a clove-hitch round the ankle.

Knots.—(*a*) The *overhand knot* is made by passing one end of a line over the line and round it, and then passing it through the loop. It is the common single knot.

(*b*) The *granny knot* is made by tying two overhand knots the same way; it is very apt to slip, but can be undone quickly.

(*c*) The *reef knot* is made by forming an overhand knot, and repeating the process with the opposite end of the line. It does not slip or come undone.

(*d*) The *clove-hitch* consists of two loops, the second being placed behind the first. Each loop is made by twisting the part of the bandage which is held in the right hand over that held in the left hand. The patient's wrist or ankle is slipped into the loops, which are then tightened by pulling the two ends, one held in each hand. When both ends together are pulled the loops will not tighten any more, however much traction is made.

CHAPTER VII.

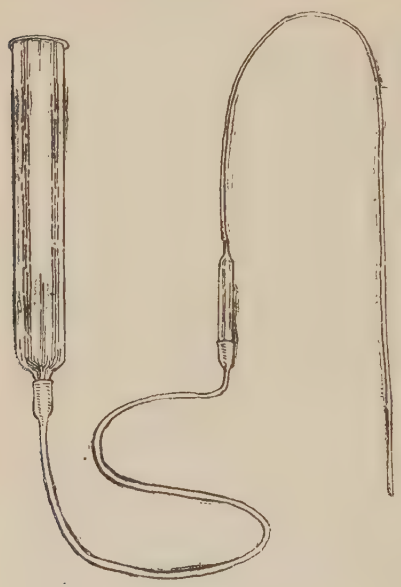
VARIOUS NURSING AND MINOR OPERATIVE MEASURES.

I. Administration of Enemata.

Enemata are liquid preparations which are injected into the rectum. The composition and size will vary with the purpose for which they are used. According to the object in view, they are classified into *purgative*, *antispasmodic*, and *anthelmintic*, which are to be returned; and *nutrient*, *sedative*, and *stimulating*, which are intended to be retained.

Method of Administration.—Usually, the patient is placed on the left side, but in certain conditions, as, for instance, after an abdominal operation or injury to the spine or pelvis, he has to lie on his back. If on the side, his buttocks should be brought to the edge of the bed, with his shoulders inclined to the other side and his knees flexed; if on the back, he should be brought as near as possible to the right-hand side of the bed, and have the right knee flexed. Place under him a warm macintosh covered with a towel or doubled draw-sheet, and turn back all the bed-clothes with the exception of one blanket. Having placed the fluid to be injected in a convenient position and filled the apparatus, expelling all air, lubricate the catheter or nozzle, and take it in the right hand. Now pass the index finger of the left hand between the buttocks, and lay it lightly on the anus, and pass the tube below the finger into the rectum, guiding it backwards, upwards, and to the left.

The sphincter muscle may contract at first, but soon relaxes. In female children care should be taken that the tube is not passed into the vagina. In many cases an adult is able to pass the nozzle himself. When the injection has been given, the tube should be gently and slowly removed from the rectum, and firm pressure at once put on the anus and perineum with a folded towel, to assist the patient in retaining the enema.



Apparatus for giving a Nutrient Enema.

Apparatus used. — A special vulcanite syringe holding half an ounce is used for the glycerine enema. In adults a soap-and-water enema is usually given with a Higginson's syringe, to the nozzle of which should be attached a No. 12 rubber catheter, but it is better to use a douche-can instead of the syringe.

The apparatus illustrated is employed for nutrient, olive oil, and turpentine enemata; it should also be used for soap-and-water enemata in young children. It consists of a rubber catheter (No. 8 with a solid end), to which is attached a foot of rubber drainage tubing, into the other end of which is fixed a small glass funnel or, better still, the barrel of a 2-oz. glass syringe. The catheter and drainage tube are joined by means of a small glass union.

Cleansing of Apparatus.—When a catheter has been used, water should be allowed to run through it from the eye downwards. It should then be laid in some disinfectant,

or boiled for three minutes in water containing a little salt to prevent softening of the rubber. India-rubber tubing should be treated in the same way. Glass funnels, glass syringes, and pipettes should be washed in soapy water, and rinsed in clean water, or boiled. If oil has been used, the whole apparatus should be boiled in water containing soap, and well rinsed. This should be done at once, as oil quickly damages rubber.

When a Higginson's syringe has been used, the nurse should see that the nozzle is clean, then pump plenty of warm water through it and hang it up with the nozzle downwards. These syringes should always be suspended from the metal end; for if folded up they crack at the folds, and soon become useless. If a rubber syringe becomes hard it should be soaked in warm water before use.

1. **Purgative Enemata.**—(*a*) *Enema Saponis.* The soap-and-water, or simple, enema is made by dissolving an ounce or a little more of soft soap in a pint of warm water. For adults one pint is usually sufficient; for children up to ten years 1½ oz. for each year is a safe rule. The temperature should be about 100° F. Five minutes at least should be occupied in injecting one pint, and the enema should be retained from ten to fifteen minutes. An erythematous rash may be produced, especially if hard soap is used.

(*b*) *Glycerine.*—This acts by irritating the wall of the rectum. One to two drachms is sufficient for an adult, and half a drachm for a child.

(*c*) *Olive Oil.*—Warm the oil (2 to 6 oz.) to about 95° F. by standing its container in hot water. This enema should be followed up in four hours' time by a soap-and-water one.

(*d*) *Castor Oil.*—Mix 1 oz. castor oil with 3 oz. olive oil; warm and inject; follow up in half an hour by a soap-and-water enema.

2. **Antispasmodic Enema.**—1 oz. of oil of turpentine is thoroughly mixed with 12 oz. of thin starch. It is useful in bringing away flatus, which is so often troublesome after abdominal operations and in enteric fever.

3. **Anthelmintic Enemata.**—These contain an anthel-

mintic or drug used to kill worms. Thus to destroy thread-worms we may inject a solution of common salt (one drachm to a pint of water), or 5 oz. of infusion of quassia. The rectum should first be cleared by a simple enema, and, if possible, the anthelmintic solution should be retained for half an hour.

4. **Nutrient Enemata.**—See p. 143.

5. **Sedative Enema.**—A *Starch and Opium enema* is given for the relief of pain, or to check excessive diarrhœa such as is sometimes present in enteric fever. For an adult 2 oz., for a child 1 oz., of thin starch, mixed with the prescribed amount of *laudanum*, is heated to 100° F., and slowly injected into the bowel by means of a glass syringe and some drainage tube, or it may be run in through the apparatus used for nutrient enemata.

6. **Stimulating Enema.**—This is most commonly given to counteract shock or collapse after an operation. A pint of normal saline solution, or 6 oz. of strong black coffee, or 4 oz. of port wine may be used for this purpose, the temperature of the enema in each case being not less than 110° F.

II. Lavage, Douching, and Syringing.

(*a*) **The Throat.**—*Syringing* is useful in severe cases of scarlet fever and diphtheria, when the pharynx becomes full of thick muco-pus. The best form of syringe to use is the 4-oz. indiarubber ball syringe. The nozzle should be only 1½ in. long. It is as well to use two syringes, so that one may be filling itself in the porringer of lotion while the other is being used.

If the child is likely to struggle, a sheet is wrapped closely round it, so that it cannot move its arms. It is then set up in bed. The nurse seats herself on its right hand, and, placing her left arm round its neck, keeps its head firmly pressed against her left side, while at the same time she bends it forward over the basin in front of her. She then takes one of the full syringes from the porringer

of lotion, passes the nozzle between the child's *back* teeth into the mouth, forcibly compresses the ball, and then replaces it in the porringer to fill again. She must be careful not to inject the lotion while the child is drawing in its breath. By passing the nozzle between or behind the back teeth, there is less risk of the tongue intercepting the lotion; by bending the child's head over the basin, the chance of fluid getting into the air passages is diminished. No patient who is seriously ill ought to be made to sit up. It can be done equally easily in the recumbent posture, the head being brought to the edge of the pillow, so that the mouth hangs down over the basin.

Instead of syringing the throat, many physicians use the *douche* or *spray*. *Gargles* do for mild cases; the patient takes a mouthful of the lotion, holds the head well back, takes a deep breath and gargles for a few seconds, afterwards spitting out the fluid.

(*b*) **The Nose.**—*Syringing* is usually done when the throat has been finished, a weaker lotion and a clean nozzle being used. A nurse should always be very gentle when syringing out a child's nose, as it is by no means pleasant; nor, if force is used, is it devoid of risk. For at the back of the nasal cavity on each side is the opening of the Eustachian tube, which leads into the middle ear. If the nose is forcibly syringed out, some of the discharge may be driven up these tubes into the ears, and there set up inflammation. There is no doubt that some cases of ear discharge originate in this way. A nurse ought never to attempt to force lotion into the nose when it is blocked by inflammatory swelling. She should place the nozzle of the syringe just outside the nostril, and gently play on the opening with a stream of lotion.

Douching is another method of cleansing the nasal cavities. It is preferable to syringing, inasmuch as there is no risk of undue force being used. About 12 in. above the level of the patient's head is placed a douche-can containing the lotion, the temperature of which should be 110° F., as it very quickly cools. To the can is attached a long

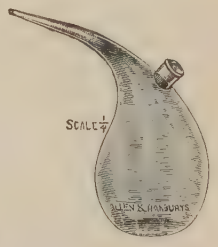
piece of rubber tubing with a stop-cock and an olive-headed nozzle. The nozzle is placed just within the patient's nostril, and he bends over the basin breathing with his mouth wide open. The lotion, if the nasal passages are free, will make its exit by the other nostril.

In cases of less severity a coarse *spray* is often of value.

(*c*) **The Ears.**—Various forms of *syringe* are used, or the *douche* described in the previous section. The lotion (temp. 100° F.) may contain soda bicarbonate (10 gr. in 1 oz.) or an antiseptic—*e.g.*, carbolic (1-40), perchloride of mercury (1-2000).

Seating herself opposite the affected ear, the nurse takes hold of it with her left hand, and draws it gently backwards and upwards if the patient is a child, backwards and downwards if an adult, to straighten the passage. The nozzle is then placed just within the upper part of the opening, the handle of the instrument being slightly depressed, so that the point is directed towards the roof. As the lotion escapes from the ear it is caught in a kidney-shaped tray, pressed closely against the neck.

After an ear has been syringed, the outer part of the canal and the meatus should be dried with absorbent wool, and the external opening carefully packed with the same. In drying the passage great care should be taken not to damage the drum, for this delicate membrane is not far from the surface in young children.



The "Undine" Douche.

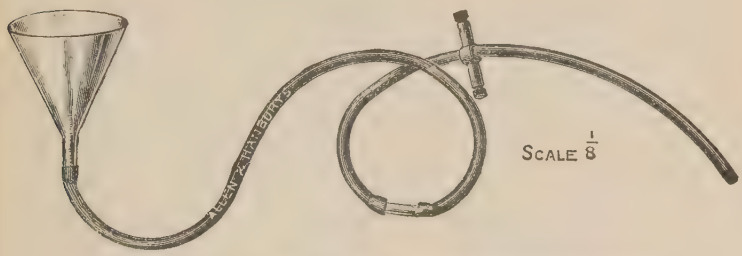
Ear-drops should be warmed by putting them in a teaspoon which has been dipped in boiling water. The patient should lie for ten minutes with the treated ear uppermost

(*d*) **The Eyes.**—*Irrigation* of the eyes may be carried out by the Undine irrigator, or, preferably, the lotion may be simply squeezed from a piece of absorbent wool. The nurse stands behind the patient's head, which is well thrown back; a towel or pad of absorbent wool is placed against the cheek; the eyelids are separated by the fingers, and if

necessary everted; the lotion is gently dropped into the hollow formed by the prominence of the nasal bones; the head is then slowly rotated towards the affected side, and the lotion allowed to flow gently across the conjunctiva into the absorbent pad on the cheek. The lotion, which should be lukewarm, is usually boric acid, saline solution, or perchloride of mercury, 1 in 10,000.

Eye-drops (p. 611) are instilled from special droppers, the lower lid being drawn down and the patient looking upwards. None of the drops should fall on the cornea.

(*e*) **The Stomach.**—*Lavage*, or washing out the stomach, is ordered in obstinate vomiting, in cases of poisoning with



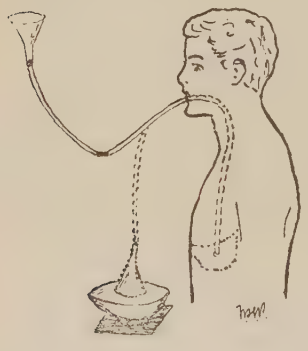
Plain Syphon Stomach Pump, including œsophageal tube and gag, for washing out stomach.

opium, alcohol, &c., and before operation in cases of intestinal obstruction.

For this operation an *adult* sits up in bed or in a chair, with the head bent slightly forwards. The apparatus consists of a 10-oz. funnel connected by tubing with a medium-sized œsophageal tube. Until the tube can be passed without causing nausea, a macintosh should be pinned round his neck and an empty basin given him to hold, since he will almost certainly vomit at first. Another basin is required, into which the contents of the stomach can run, a large jug of water at 100° F., and a pint glass measure.

The end of the tube is dipped in hot water, or glycerine, and passed over the tongue in the middle line until it reaches the pharynx, a gag being used if necessary. The

patient is now told to swallow, and the tube is pushed on till 18 in. have passed. The end will now be in the stomach. After a few times, the patient is usually able to pass the tube himself, and then the treatment is often handed over to a nurse. When filling the stomach the funnel must never be allowed to become quite empty, otherwise air will be introduced. When the nurse wishes to empty the stomach, which should be done when about a pint to a pint and a half has been introduced, she must lower the funnel before all the water has disappeared down the tube, and, while doing so, she must depress it below the level of the patient's stomach, or of course the water will not run out. The washing out is repeated until the water returns quite clear.



Gastric Lavage.

For a *child* a large soft rubber catheter with a solid end and several lateral openings is taken and connected with a funnel by 18 in. of tubing. Lukewarm saline solution of the strength of ¾ per cent is the most suitable cleansing agent to use. The child, wrapped in a thick bath towel, is seated in a nurse's lap looking towards her left side, its head supported by her right arm. The doctor dips the end of the tube in glycerine, and, the lower jaw of the child being depressed by the nurse who is holding it, he rapidly passes the tube over the centre of the tongue into the pharynx and so into the stomach. If the child has teeth, it will be necessary to hold a cork or gag between the jaws to prevent it biting the tube. Any gas that is present in the stomach having been allowed to escape, a few ounces of the saline solution are introduced, care being taken not to pour in more than the stomach can comfortably accommodate. This is run out, and the

operation repeated until the fluid that returns is quite clear.

(*f*) **The Rectum.**—Lavage is a most useful method of treating acute diarrhœa in young children. Plain water at a temperature of 100° F. is used, or it may have a teaspoonful of common salt, or some emollient such as starch, added to it. In chronic diarrhœa, astringents, such as tannin and sulphate of zinc, are sometimes used. To do any good the large intestine above the rectum must be washed out, so that a much larger quantity of fluid should be used than when giving a soap-and-water enema. For a child of two years at least a pint should be run in by means of the nutrient-enema apparatus. One nurse should inject the water, while a second passes her left hand under the child's legs and raises its buttocks well off the bed, while with her right hand she kneads the left-hand side of the abdomen in an *upward* direction, so as to help the fluid up the bowel. The catheter should be inserted just within the anus, and pushed in as the water flows in and distends the bowel. It is then not so likely to double up.

(*g*) **The Vagina.**—Warm antiseptic douches (105° to 110° F.) are useful in septic conditions (*e.g.*, cancer, sepsis after operation, or childbirth), in pelvic inflammation, and in cases where a pessary is being worn. Hot douches (115° to 120° F.) are valuable in uterine and vaginal hæmorrhage. On the other hand, douches are often used unnecessarily and may do harm.

The following articles are required: a douche-can with 6 ft. of tubing, a glass vaginal nozzle and a tap, a bath-thermometer, a measure, a jug with 4 quarts of lotion at a suitable temperature, a douche-pan or full-sized bed-pan, a large macintosh, and two soft towels.

Having placed the douche-can about 1 ft. above the level of the bed, and the patient on the bed-pan, the nurse turns the bedclothes down to the patient's knees and places a blanket on her body. She then washes her own hands, and afterwards proceeds to cleanse the vaginal

orifice with swabs. Having done this, she allows a small quantity of fluid to run through the tube to expel the air. She then turns off the tap, greases the nozzle with vaseline or carbolic oil, and, separating the labia with the fingers of her left hand, passes it gently into the vagina along the posterior wall for about 4 in. The tap is now turned on, and the water allowed to flow in in a steady stream, and out again into the bed-pan. As soon as this is nearly full, it must be emptied.

In some cases, instead of using a bed-pan, the patient is brought to the side of the bed and placed in the Sims position (p. 652), with the macintosh hanging over the edge of the bed and arranged so that the water runs down it into a bucket on the floor.

When the douche is finished, the nurse should, before removing the bed-pan, depress the perinæum with one finger to get rid of any excess of fluid. The patient is then dried and placed in bed, with a towel beneath her for a short time to catch any water that may subsequently drain away from the vagina.

(*h*) **The Bladder.**—Useful in cystitis. A glass funnel with 4 ft. of tubing, a catheter with a short piece of tubing, a glass connection to join the two together, a kidney tray, a porringer, a thermometer, and a jug with the solution, are required. All should be sterile.

First, the catheter is passed, and any urine present withdrawn; then the tubing and part of the funnel are filled with lotion, and attached to the catheter, the tubing being pinched meanwhile. By raising the funnel a foot or two, the lotion, at 100° to 105° F., is run in until it begins to rise back in the funnel, showing that the bladder is full. If the funnel is then lowered, and the lotion allowed to syphon back into the porringer, the quantity can be measured and so the capacity of the bladder ascertained. To wash out, the process of filling (to within an ounce of the capacity only) and emptying again is repeated until about 2 pints of the lotion have been used. Over-distension is painful and dangerous, as infection may be driven up the ureters.

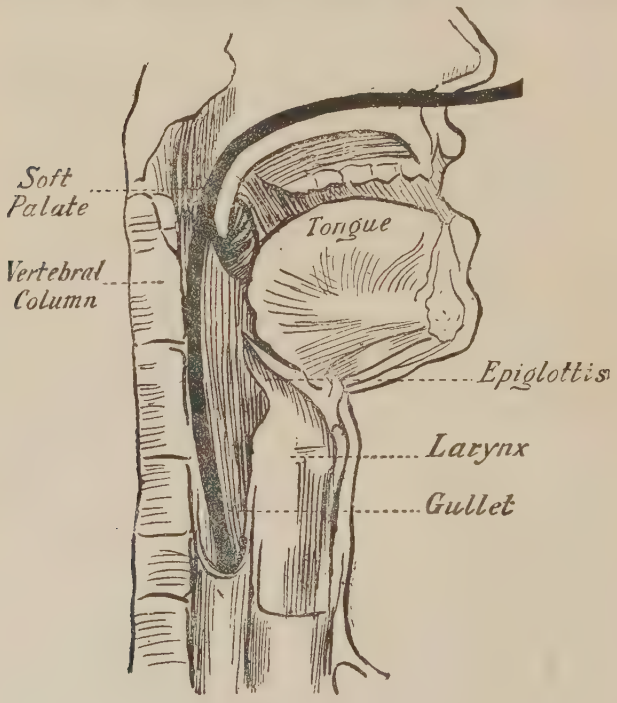
III. Artificial Feeding.

(*a*) **By Mouth.**—(1) *The Food is injected into the Mouth* This is generally used for very young infants who refuse the bottle because of the pain which sucking causes them. Thrush, or any form of stomatitis, might produce this condition. It is also used after the operation for harelip has been performed. A couple of inches of drainage tubing are fixed on to the nozzle of a glass syringe, and the milk is slowly and intermittently injected, the child, which is in the recumbent position with the head on one side, being given plenty of time to swallow.

(2) *A Tube is passed through the Mouth into the Stomach.* —This is not so easy as passing a tube through the nose, and, as a rule, is used only when the nasal tube has failed to pass owing to complete obstruction of the nasal passages. The apparatus and the method of using it are the same as described under the heading of lavage of the stomach.

(*b*) **By Nose.**—This is especially suitable for young children, who cannot, or will not, take sufficient nourishment on account of disease or paralysis of the soft palate, pharynx, or larynx—*e.g.*, post-diphtheritic paralysis. It is also used in coma, delirium, and hysteria. The apparatus used is a rubber catheter (about No. 6 size), to which is attached a piece of drainage tubing, a short piece of glass tubing being used to connect the two. To the other end of the drainage tubing may be fixed either a glass funnel or the barrel of a 2-oz. syringe. The child being recumbent, and, if there is only one nurse to do the feeding, wrapped up in a draw-sheet, the end of the tube is oiled, and passed along the floor of the nose into the pharynx, and on into the stomach. The nurse must be careful, when introducing the tube into the nostril, to point it straight backwards, and not upwards ; otherwise it will at once catch against the roof. The flexibility of the catheter leads it sometimes to coil up at the back of the mouth. The tube having gone down, the next question which the beginner

asks herself is, "Is it in the gullet or the windpipe?" The latter lying immediately in front of the former (see fig.), it would at first sight appear very easy for the tube to get into the wrong passage. As a matter of fact this does not often happen, except with adults, though a



Section through head and neck, showing nasal tube in position.

nurse when first performing the operation often thinks that this is the case because she hears air coming from the tube, whereas it is only gas escaping from the stomach. If air bubbles up in a steady stream during both expiration and inspiration, and if pressure with the hand on the epigastrium forces out more air, the tube must be in the

stomach. If the tube had passed through the larynx, the child's breathing would be embarrassed, and air would be felt coming from the end of it with each expiration. Moreover, the tube would very soon come to a standstill, since the windpipe is much shorter than the gullet. If, therefore, 12 in. of tubing have passed through the nose without meeting with any obstruction, and the child is breathing quietly, the end of the catheter, provided it is not curled up in the mouth, is certainly in the stomach.

Having passed the tube, it is well to wait for a few seconds before pouring in any food, to allow the child to quiet down, if it has been coughing or struggling. The milk which is given is often peptonised. It happens not infrequently at some stage in the feeding that the tube gets blocked, and the fluid consequently ceases to run down it. This little difficulty is easily surmounted by passing the thumb and forefinger down the drainage tubing, squeezing it firmly while doing so. If the child coughs during the operation, the drainage tube should be nipped between two fingers. The milk must be poured in in a continuous and steady stream; one lot should not be allowed to disappear completely from sight before more is added.

At the end of the operation the tube should be withdrawn steadily, and not with a jerk, the drainage tube being firmly caught between the thumb and finger. The object of this precaution is to prevent food escaping from the tube as the end of it is withdrawn. The tube should now be thoroughly cleansed, and then laid in a basin of boracic lotion until the next feed is due

(*c*) **By Rectum.**—Nutrient enemata are given when a patient is taking insufficient food by the mouth, or when, from some cause or other, it is considered desirable to give the stomach a complete rest. Under such circumstances food is injected into the rectum, the bowel having been previously emptied of fæces. The powers of digestion possessed by the rectum are naturally not very marked, since under normal conditions this is no part of its work, though

it freely absorbs fluid. Any food, therefore, that forms part of a nutrient enema must be thoroughly digested before use. Milk should be *pancreatised* before it is injected into the bowel. To effect this four pancreatic tablets are added to 1½ pints of milk, previously boiled and cooled, and this is then incubated, or kept at blood-heat, for twenty-four hours. In this way digestion is carried beyond the stage of peptones to that of amino-acids, which are more readily absorbed by the rectum. To the digested milk, glucose, about 1½ oz., is added. Six ounces every six hours is a usual quantity for an adult, half that quantity being used for children of five years. Patients who are being systematically fed by the bowel should have a plain water enema once in each twenty-four hours.

If the milk is only *peptonised* for an hour or two, a certain amount of solid material is always left on the wall of the bowel. Before each enema is given, therefore, the rectum should be gently washed out. This not only removes the remains of the previous injection, but freshens up the mucous membrane of the gut, and so predisposes it to absorb the food which immediately follows.

The patient being in the position already described (p. 131), the nurse pours a small quantity of water (100° F.) into the glass funnel, till it appears at the eye of the catheter, thus expelling all air. She then nips the catheter, and having oiled it, passes it carefully into the bowel for about 6 in. in a backward and upward direction. She then slowly runs in 6 to 8 oz. of the fluid (if the patient be an adult). Depressing the funnel below the level of the bed, before it is quite empty, just as in washing out a stomach, she lets the fluid run out again into a vessel which she has ready for it. This process she repeats three or four times, till the lotion comes back quite clear. She then very slowly runs in the nutrient enema. This should be about 110° F. in temperature, as it will lose a good deal of heat before it reaches the rectum, and it should take at least five minutes to give 4 oz. To ensure the fluid entering very gradually, the funnel should be raised but a very short distance off the bed.

Having completed the operation, the nurse slowly withdraws the tube, and, if the patient is a child, keeps a folded towel pressed against the anus for a few minutes. This will help to counteract any tendency to reject the enema. In furtherance of this object, the patient should lie quietly on his left side for at least an hour after the injection. In cases where the bowel is irritable and tends to reject the enema, the lower end of the bed or cot should be raised

(*d*) **By Gastrostomy Tube.**—(See p. 541).

IV. Infusion and Transfusion.

Infusion implies the giving of fluid by routes other than the mouth. *Transfusion* is the conveying of blood from the vessels of one person to those of another.

(*a*) **Rectal Infusion**—*Fluid.*—Water is better than saline solution, as it is more rapidly absorbed; a 6 per cent solution of dextrose, however, although more slowly absorbed than water, is often preferred because of its nutritive value. *Apparatus*—a reservoir (*e.g.*, a 2-oz. glass syringe barrel), rubber tubing, glass-junction, and a soft rubber catheter. *Method*—the patient lies down in the left lateral or dorsal position with hips raised; the catheter is passed up as far as possible, and the fluid is given very slowly at 105° F., the temperature in the reservoir being maintained at 115° F. by adding very hot water or solution; half a pint should be given four-hourly.

In cases of peritonitis especially, the continuous rectal administration of water by the "drip" method (*proctoclysis*) is frequently adopted after operation; a tube with three or four openings is introduced about 4 in. into the rectum, and the reservoir placed not more than 6 in. above the level of the rectum; the height is arranged so that the water issues at the rate of about three or four drops a second; it can be absorbed by the bowel at about this rate (1½ pints per hour). No clip is used, so that when the

patient strains or passes flatus the fluid can flow back into the can and not be discharged into the bed.

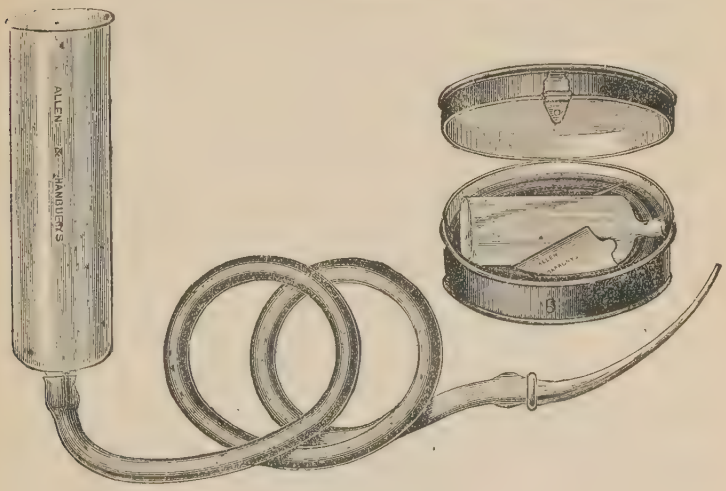
(*b*) **Subcutaneous, Intermuscular, and Intra-peritoneal Infusions**—*Fluid.*—Plain water would damage the cells, and solutions given in these ways must be approximately isotonic with (*i.e.*, having the same osmotic pressure as) blood and the tissue fluids—a 6 per cent solution in the case of dextrose, and a 0·9 per cent solution in the case of sodium chloride ("normal" or "physiological" saline solution).[1] *Apparatus*—a reservoir (*e.g.*, a 2-oz. glass syringe barrel or a modified thermos flask), with rubber tubing, a V-shaped glass connection, and two serum needles. To minimise cooling, the rubber tubing should not exceed 12 in. in length. *Site*—the axillæ, pectoral regions, flanks, abdominal wall, and thighs are commonly used. In children under four years of age the back is a convenient site, the space between the scapula and the chest wall being often used in babies. In very small infants the injection is sometimes made into the peritoneal cavity. *Method*—paint site with iodine; expel air by running off a little of the fluid; then clamp the tube while inserting the needles. Gently massage the tissues to disperse the fluid, keeping the site covered with wool, as it is apt to get cold; finally, close the punctures with collodion. At the start the fluid naturally travels rather quickly, and the temperature in the reservoir (which should be covered completely with cotton-wool) should, therefore, not exceed 110° F. Afterwards it should be kept at 130° F. If fluid leaves the needle at the rate of 10 oz. per hour, it will then usually be at about 100° F. when it passes under the skin.

(*c*) **Intravenous Infusion**—*Fluid.*—Bayliss's gum-saline solution [2] is now usually given instead of normal saline solution, for the latter has the defect that it rapidly passes out of the circulation. It can be kept sterilised in sealed

[1] 1 per cent equals 4½ grains per fluid ounce; 6 per cent thus equals 26 grains per fluid ounce, and 0·9 per cent equals 80 grains per pint.

[2] Bayliss's gum-saline solution is 60 grammes gum acacia and 9 grammes sodium chloride, dissolved in 1 litre water in a water-bath and strained.

bottles ready for emergencies. *Apparatus.*—Reservoir, tubing, and cannula ; hypodermic syringe, and 1 per cent novocaine solution ; scalpel, dissecting forceps, artery forceps, piece of rubber tubing, ligature, and suture. *Site.*—Usually the median basilic vein in front of the elbow ; in children the internal saphenous vein in front of internal malleolus may be used, or the superior longitudinal sinus in infants in whom the fontanelle is still open. *Method.*—

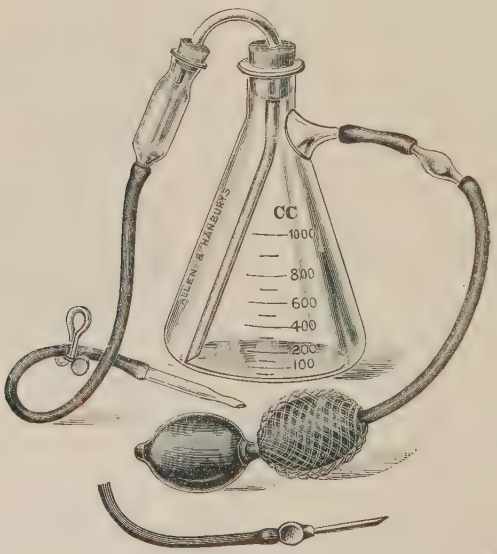


Infusion Apparatus.

The site is cleansed and novocaine injected. The vein, made prominent if necessary by constricting the limb above with a piece of rubber tubing (which must be removed before the solution is run in), is exposed by dissection ; two ligatures are passed round it, the lower one is tied, and the upper one left loose. The cannula is inserted into an opening made in the vein. On completion of the infusion the loose ligature is tightened, and the wound stitched. The temperature in the reservoir is kept at 110° F. Great care must be taken that all air is expelled from the tubing before the cannula is inserted, and that the apparatus is

sterile. One to three pints may be given, and the rate of flow should not exceed one pint in ten minutes.

(*d*) **Blood Transfusion** — *Fluid.* — Blood, obtained, usually by the "receptacle" method, from a donor, who must be healthy and give a negative Wassermann test, and whose blood has been examined to see if it is compatible with that of the recipient. *Apparatus* and *Method* are the same as for the intravenous injection.



Keynes' Transfusion Apparatus for Blood.

In the **receptacle method** of obtaining the blood, a hollow needle is inserted into an elbow vein of the donor, and 500 c.c. of blood allowed to flow into a sterilised graduated glass receptacle, containing some sterile sodium citrate solution to prevent coagulation, the mixture being kept well stirred with a glass rod. It is strained through sterile gauze to remove the froth, and introduced slowly into the recipient's vein by an ordinary saline

infusion apparatus or that of Keynes. The receptacle should be kept warm by standing it in warm water.

Uses of Infusion and Transfusion.—It may interest the nurse to know the principles which govern the selection of the fluid.

Saline or dextrose solution is used (1) to increase the fluid in the body, especially in cases in which the circulation is efficient (*e.g.*, before and during serious operations to prevent shock) ; and (2) to replace fluid lost by continuous diarrhœa and vomiting in the gastro-enteritis of infants. It soon passes out of the blood-vessels into the tissues, however, and thus does not for long keep up the volume of blood in the blood-vessels. Dextrose has the advantage that it is an important tissue food and prevents *acidosis* (*i.e.*, the accumulation in the blood of the poison, diacetic acid, which is formed if insufficient carbohydrate food is taken).

Gum-saline solution is designed to resemble blood closely as regards viscosity and osmotic pressure ; it can thus restore volume to the blood in the blood-vessels, since it remains in them. It is, therefore, used in loss of circulating blood from hæmorrhage and from shock.

Transfused blood not only restores volume to the blood in the vessels, but has the added advantage that it can carry oxygen. It is indicated, therefore, when there is not enough circulating blood to ensure efficient oxygenation of the tissues—*e.g.*, in severe cases of hæmorrhage or shock, and in poisoning by coal-gas.

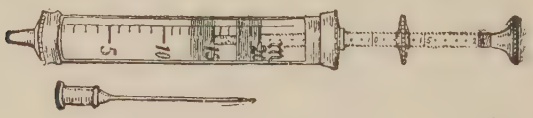
V. Injection of Drugs.

(*a*) **Hypodermic Injection.**—Having first tried the syringe, to see that the piston does not allow fluid to escape behind it when the opening in the nozzle of the instrument is plugged with the finger, the nurse sterilises it and the needle by drawing up spirit, and after thoroughly emptying it fills it with the solution poured into a minim measure, taking a little more than the required dose. Now, placing

the needle on the nozzle of the instrument, she should direct it upwards, and press the piston slowly home, until a drop of fluid escaping from the needle shows that all air has been expelled.

The next step is to mark off the dose to be given. This is best and most safely done by means of a regulator which moves up and down the piston-rod, on which are marked tiny divisions, each of which represents a minim. If five minims are to be given, the regulator is screwed up until it is five of these divisions distant from the barrel of the syringe, as shown below. Obviously, when the piston is driven home and the regulator comes to a stop against the barrel, those five minims, and no more, have been injected.

Instead of prepared solutions, tabloids containing the



Hypodermic Syringe.

exact dose are now very commonly used. In this case the nurse dissolves the tabloid completely in a few drops of boiled water in a sterile spoon or watch-glass, and having drawn the fluid into the syringe proceeds to expel the air as above described.

In giving the injection, a fold of skin, free from veins, is raised between the thumb and forefinger of the left hand, and the point of the needle is pushed in beneath the skin in a horizontal direction not less than half an inch, and the injection given. As the needle is withdrawn, the thumb and forefinger of the left hand should lightly but firmly grasp the opening in the skin, to prevent the possibility of fluid escaping. When the needle has been withdrawn, the little swelling should be gently rubbed in the upward direction, to promote rapidity of absorption.

In the case of irritating drugs, such as mercury, ergot,

arsenic, digitalis, ether, brandy, and camphor, the needle should be passed straight downwards into the limb, so that the injection is made, not beneath the skin, but into a muscle—*e.g.*, into the buttock or outer side of the thigh.

(*b*) **Injection of Antitoxin or Vaccines.** The skin of the abdomen, thigh, or axilla is painted with tincture of iodine ; the sterilised syringe is filled, and any air evacuated from it and the needle, as in the case of a hypodermic syringe. If the dose is to be given subcutaneously, the skin is picked up, and the needle pushed into the subcutaneous tissues for a considerable distance in order to prevent the injected fluid escaping. The injection is made slowly, the needle withdrawn, and the puncture sealed by a collodion dressing. The swelling produced is not massaged, but allowed to subside slowly as the fluid is absorbed. The site of the injection is often tender on the following day. Antitoxin is often given deeply into the muscles on the outer side of the thigh.

(*c*) **Injection of Anti-Syphilitic Remedies.**—*Salvarsan* (known also as kharsivan, or 606) is supplied as a yellow powder, which has to be dissolved in pure freshly-distilled water, then rendered alkaline and filtered ; the resulting solution is administered intravenously without delay. In the case of adults the fluid amounts to not less than 75 c.c.

Neo-salvarsan (neo-kharsivan, or 914) and *galyl* are also usually given intravenously by means of a syringe. The point of the needle is inserted into a vein at the bend of the elbow, this having been made prominent by fastening an elastic band round the upper arm and making the patient grasp a roller bandage. The piston is withdrawn to see whether blood flows back into the syringe, showing that the needle is in the vein ; the rubber band is then released and the hand opened, and the piston is pushed steadily home. These drugs may also be given intramuscularly, but this method is often painful.

Mercury Cream is injected deeply into the muscles of the buttock about midway between the top of the intergluteal

fold and the top of the great trochanter. *Sulfarsenol* is usually injected in the same position, but not so deeply; it is placed just superficial to the muscles. The site of injection of both drugs is afterwards well massaged with a pad of lint.

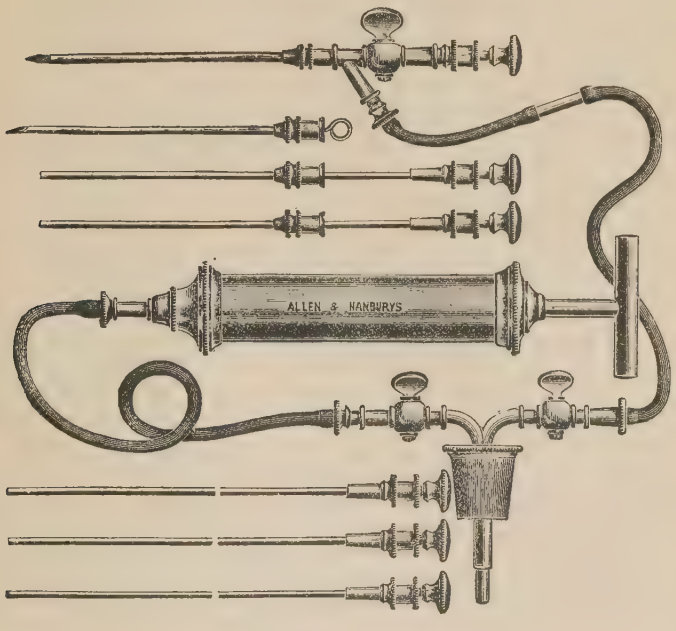
VII. Venesection.

Blood-letting is often useful in uræmia, and relieves the failing heart in a bad case of cardiac disease. The median basilic vein at the bend of the elbow is made prominent by tying a bandage or piece of rubber tubing round the upper arm, sufficiently tightly to obstruct the return of blood through the veins, while not interfering with the arterial flow as shown by the presence of the pulse at the wrist. The patient may also tightly grasp a roller bandage. The surgeon opens the vein with a scalpel, and the blood is allowed to flow into a graduated measure. When a sufficient quantity, usually from 10 to 20 ounces, has been withdrawn, the constriction is removed, a stitch is inserted in the skin, and the part firmly bandaged. The patient must be watched for symptoms of faintness.

VIII. Aspiration and Tapping.

(*a*) **Of the Chest.**—The apparatus commonly used is a *Potain's aspirator*, which consists of a bottle, fitted with a rubber cork through which passes a double metal tube with two taps; the taps connect by stout rubber tubing with an air-pump on the one hand, and the aspirating cannula on the other. Each cannula has its trocar and blunt stilette. The tubing, trocar, cannula, and stilette are sterilised, and the apparatus is tested to see that it is properly connected up and in working order. The skin is painted with tincture of iodine, and the site of the puncture may be anæsthetised by the ethyl-chloride spray. The air in the bottle having been exhausted, the trocar and cannula are inserted; the trocar is then withdrawn, and the tap

turned. When the fluid ceases to flow, the cannula is removed and a collodion dressing applied. The patient should be kept lying down throughout, as there is a tendency to fainting or collapse when the chest is emptied Before being sterilised after use, the apparatus requires



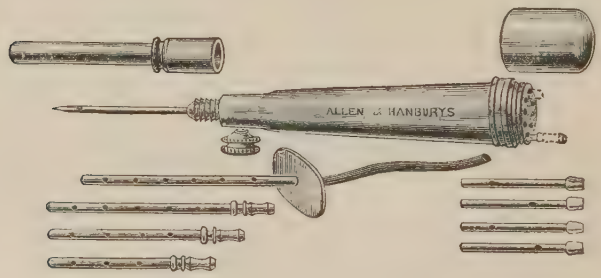
Potain's Aspirator.

carefully washing through with cold water, to remove the albuminous fluid which would otherwise be coagulated by the heat and become irremovable.

(*b*) **Of the Abdomen.**—The patient is propped up in bed in Fowler's position, and the bladder is emptied, by catheter if necessary, a few minutes before the operation. Shaving may be required. *Southey's apparatus*, consisting of a fine trocar and cannula, provided with a plate and

very narrow rubber tubing, is commonly used. A binder is placed round the abdomen, and is tightened as the fluid is withdrawn. The site of the puncture is sterilised and anæsthetised, and the cannula introduced with the aid of the trocar; the plate is fixed with strips of strapping; the trocar is withdrawn, and the fluid flows through the tubing, the end of which has already been placed in a basin containing sterilised water. When the flow stops, the cannula is removed and collodion applied.

(*c*) **Of the Limbs.**—Oedematous limbs are sometimes tapped, either by pushing small Southey's tubes through



Southey's Apparatus.

into the subcutaneous tissues, or by making short incisions in the sterilised skin. In the latter case gauze and wool dressings should be applied, and macintoshes arranged to prevent wetting of the bed. Hot-water bottles and a cradle are required.

IX. Lumbar Puncture.

By **Lumbar Puncture** is meant the passing of a hollow needle into the spinal canal, for the purpose of withdrawing a portion of the cerebro-spinal fluid. It may be performed for one of the following reasons—

(*a*) *To relieve increased pressure* on the brain and spinal cord.—When the meninges are inflamed there is an in-

crease in the amount of cerebro-spinal fluid. As a result, there is excessive pressure on the brain and spinal cord which gradually produces loss of power in the limbs and also loss of consciousness. To relieve these symptoms the excess of cerebro-spinal fluid is removed by lumbar puncture.

(*b*) *For the purpose of injecting a serum.*—This is done in cases of epidemic cerebro-spinal meningitis and in tetanus, two diseases in which the central nervous system is the subject of attack. By injecting the antitoxin into the spinal canal, the remedy is at once brought into contact with and neutralises the toxins that are present in the cerebro-spinal fluid.

(*c*) *To produce spinal anæsthesia.* See p. 521.

(*d*) *For purposes of diagnosis.*—In the fluid drawn off by lumbar puncture the germ which has caused a cerebro-spinal meningitis may be discovered, and if there is a specific remedy for that germ it can be at once administered.

In performing this operation great care must be taken to prevent infection of the spinal canal. Also, the puncture must be made in such a place that there is no risk of injury to the spinal cord. The spot usually selected is above and slightly to one side of the fourth lumbar spinous process. The patient, if possible, sits up and bends well forward, that posture tending to separate the spines of the vertebræ and make it easier to pass the needle between them. If too ill to sit up, he lies on his left side with the knees drawn up and the shoulders bent.

X. Catheterisation.

Catheters may be of soft red indiarubber (Jaques's), or metal, or elastic gum, either black, brown, or silk-web; female catheters are often of glass. The Coudé catheter is bent upwards at the end, and is used in cases of enlarged prostate. Double-way catheters may be used for washing out the bladder. Elastic-gum catheters are provided with

wire stilettes, which can be bent to any shape the surgeon wishes the catheters to assume. The part of the catheter below the eye is made solid, so as to prevent any collection of septic material in the blind end. Catheters are measured according to two *gauges*, the English and the French. The English scale runs from 1 to 16, and the French from 1 to 30; roughly, a catheter number in English corresponds to twice that number on the French scale.

Instruments made of metal, glass, or indiarubber are *sterilised* in the ordinary way by boiling, and even those of silk-web material can be boiled for five minutes without damage provided no soda is used. The brown and black elastic-gum instruments, however, are roughened and destroyed by boiling or by keeping in an antiseptic solution. They may be sterilised by boiling in paraffin in a Herring's tube, or by placing in a special stoppered glass tube fitted with a receptacle for holding some granules of tri-oxymethylene. This substance, slowly decomposing, gives off formalin vapour by which the catheters are sterilised within twenty-four hours; they should be rinsed in sterile water before use to remove the formalin. With regard to *lubricants*, olive-oil is harmful to rubber and gum-elastic catheters, and probably the most satisfactory lubricant is sterilised paraffin liquidum B.P.

Catheterisation in the Female.—Being quite sure that the catheter is fit for use, the nurse should get ready a vessel in which to catch the urine, a basin of boracic lotion, some wool sponges, and some sterilised paraffin; after which she washes her hands, and soaks them in an approved disinfectant.

The patient is placed on her back, the knees drawn up and slightly separated, and a blanket thrown over each. This keeps her warm, and prevents undue exposure. The nurse standing on the right of the patient now passes her left hand between the knees, separates the labia, and carefully cleanses the parts round the meatus (which appears as a small depression immediately above the

vaginal opening) with the wool sponges and boracic lotion, wiping from above downwards so that any vaginal discharge that is present may be removed from the orifice of the urethra. After this she washes and disinfects her hands. The catheter is then dipped in the paraffin and introduced, care being taken by the nurse to touch only the part which will be left outside. In cases of prolonged retention the urine should be withdrawn slowly and the bladder not completely emptied, to avoid ill-effects which might follow a sudden relief of pressure. As the catheter is withdrawn, the finger should be placed over the end of it to prevent urine escaping from it into the bed. The parts are then bathed and again dried.

When, for some reason, the knees may not be separated, the nurse in passing the catheter must trust to her sense of touch. The urinary meatus is situated just above the vagina, and can easily be felt. It has a slightly thickened rounded edge, and the nurse, by placing the first finger on it, can easily pass the catheter into it. Care must be taken not to pass it into the vagina. If this is done, the catheter must be boiled again or another used.

Catheters after use should be washed out through the eye under the tap, syringed through with an antiseptic solution, thoroughly washed with soap and water, and finally sterilised in the manner described above.

Bougies are solid instruments used for dilating strictures. Those made of metal—*e.g.*, Lister's sounds—are rigid, but those composed of black and brown elastic-gum and silk-web material can be made to assume any desired curve by softening in warm water and then stiffening in cold water.

XI. Preparation for Examination.

(*a*) **Of the Abdomen.**—The patient lies on the back; the blankets and quilt are turned right down, and the sheet drawn down to the pubes; the night-shirt is raised as far as the breasts.

(*b*) **Of the Vagina.**—The nurse should be present at the examination. A rubber glove, a receiver with swabs, and a lubricant, such as vaseline, should be provided. The patient lies in the left lateral or the dorsal position (p. 652), as preferred by the surgeon, and the clothes are arranged to allow free access to both the perineum and the abdomen. Hot water, soap, and towel should be in readiness.

(*c*) **Of the Rectum.**—The rectum should previously have been emptied of fæces. A rubber glove or finger-stall, a receiver, swabs, and vaseline are needed. The patient should lie in the left lateral position, with the buttocks slightly over the side of the bed and the knees drawn up. The clothes should be arranged to allow of a view of the anus.

XII. Test and Bismuth Meals.

Test Meal.—An examination of the gastric contents after a test meal is generally desirable in any case which presents persistent gastric symptoms, especially with a view to distinguishing between chronic ulcer and cancer, or between gastritis and gastric ulcer. The patient rests in bed for a day or two on a restricted and light diet. In *Ewald's method*, a suitable test-meal (1½ pint of weak tea with a little milk and sugar, and a slice of thin buttered toast) is given on an empty stomach. The meal should be withdrawn after an interval of an hour. The patient sits upright, and a lubricated soft stomach-tube is passed into the stomach; attached to it is a piece of rubber tubing about 3 feet long, from the end of which the air is withdrawn by suction with an ordinary glass syringe. This causes syphon action to start when the end of the tubing is lowered below the level of the stomach. The material withdrawn is measured, labelled, and sent to the pathologist. In *Rehfus's fractional method*, the patient first swallows a small tube, and then takes a basin of thin gruel, samples

being withdrawn by means of the tube every fifteen minutes.

A **Bismuth Meal** is necessary in the X-ray examination of the alimentary system. One often used is composed of ¾ pint milk, 1 oz. bread, and sugar to taste, to which 2 oz. bismuth carbonate is added. Sometimes 3 oz. barium sulphate, suspended in some thick medium, is used instead. The meal should replace one of the meals usually taken, preferably breakfast, and no aperient should have been taken for twenty-four hours prior to the examination. The patient stands in the upright position behind a fluorescent screen, and the passage of the meal through the œsophagus, pylorus, &c., is observed.

XIII. The Care of Syringes.

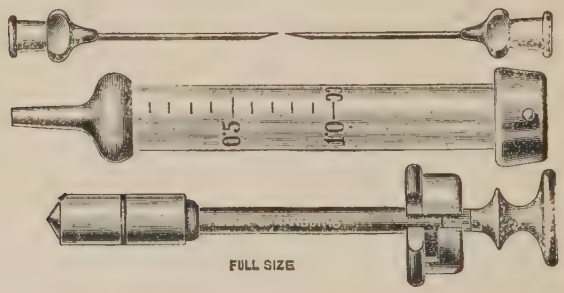
To avoid breakages, syringes are sometimes made wholly of *metal—i.e.*, with metal plunger and metal barrel; but these often do not fit accurately, with the result that air or fluid gets past the plunger. All nurses should thoroughly understand the construction of *glass* syringes, otherwise in cleaning and sterilising them they are apt to break them or make them defective. There are two common types, totally different in their construction, viz.—

(*a*) **The "Record" Syringe,** in which a metal plunger slides in a graduated glass barrel, which has cemented metal ends and is ground to fit the plunger closely. The important point to note is that, while both glass and metal expand on heating and contract on cooling, glass cools, and therefore contracts, much more rapidly than metal. Therefore, if after sterilising an attempt is made to insert the plunger before it is cold, the glass will contract on the still expanded metal and crack. The same happens on cooling, whenever the syringe is boiled without removing the plunger. A failure to recognise this simple fact is the common cause of breakage of a "Record" syringe.

Similarly in the all-glass syringe, the plunger is often of solid glass, and when this is the case will naturally cool more slowly than the barrel.

Before use, take the syringe to pieces and boil. In assembling it afterwards, see that the plunger is quite cold before making any attempt to insert it in the barrel. If needed in a hurry it may be cooled in cold sterile water.

After use, remove any serum or pus by syringing through the needle several times with cold water; take the syringe to pieces and wash the parts thoroughly under a tap; remove moisture, and then syringe methylated spirit through the needle; take the syringe to pieces again and



"Record" Syringe.

dry; finally, reassemble. The stilette of the needle is effective in drying the interior of the latter, if it is inserted, withdrawn, and dried several times.

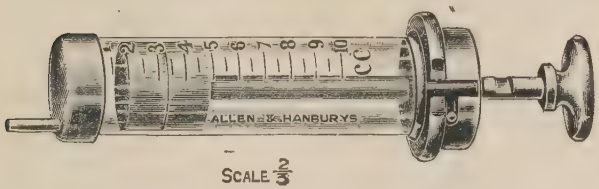
(*b*) The **Adjustable-piston Syringe**, in which a metal frame holds an inexpensive loose glass barrel (of which a stock is kept for replacement when breakages occur), and the plunger consists of an asbestos or rubber piston, which can be enlarged to fit the barrel tightly by screwing up the piston-rod. There are several points to notice with regard to these syringes: the glass barrel is often very slightly wider at one end than the other, and the wider end should be placed at the nozzle-end of the frame, otherwise when the screwed-up piston is withdrawn it will fail to fit the

barrel tightly ; the rubber washers at the ends of the glass barrel must be renewed at intervals ; the plunger, if asbestos, should never be completely removed from the barrel for cleaning, lest it be damaged in being replaced ; finally, the syringe should not be put away screwed up tightly, otherwise piston and washers will rapidly perish.

Before use, unscrew the top, but do not remove the plunger from the barrel ; boil ; then replace the top and screw up the piston-rod until the piston fits tightly.



Syringe with Asbestos Plunger.



"Record" Syringe, with peripheral nozzle for intravenous injection.

After use, remove serum or pus by syringing cold water through the needle ; unscrew the top, and withdraw the plunger almost to the end of the barrel ; wash all thoroughly under a running tap ; remove moisture with a soft towel, and then syringe methylated spirit through the needle ; dry the syringe, and leave it only slightly screwed-up.

Thus, in the "Record" syringe the plunger *must* be removed for sterilising, while in the adjustable piston syringe it is advisable *not* to remove it either for sterilising or cleaning.

XIV. Collecting Material for Laboratory Investigation.

1. **Blood**—(*a*) for *Blood Culture.*—The 5 to 10 c.c. required are taken under strict aseptic conditions from a vein. The blood is placed immediately into a sterile tube containing sterile sodium citrate solution to prevent clotting. The syringe should not be placed in "sterile water" after being boiled and previous to being used, but handled direct from the steriliser.

(*b*) For *Widal Reaction.*—The ear-lobe or finger-tip, after being cleaned with ether, may be pricked with a sterile needle, and the blood allowed to flow into a slender glass tube, the ends of which can be sealed in the flame of a spirit-lamp. A better method, in that it provides more serum for carrying out tests with the various organisms of the typhoid-paratyphoid group, is to take blood from a vein by means of a sterile syringe. The blood should be immediately transferred to a sterile specimen tube and allowed to clot.

(*c*) For *Wassermann Reaction.*—Blood, 3 to 5 c.c., is withdrawn from a vein, and allowed to clot in a sterile tube.

(*d*) For *Blood Films.*—A spot of blood is obtained by pricking the ear or finger, and then touched with the centre of a clean No. 1 cover-slip. A second cover-slip is applied to the drop, and, when the blood has spread evenly, the two cover-slips are slid apart. The blood films are allowed to dry in the air, and must not be fixed by heat.

2. **Cerebro-Spinal Fluid.**—For bacteriological examination or Wassermann reaction, the fluid is put into sterile tubes. When a cell count is to be done, 1 c.c. of the fluid is measured into a tube, and 1 c.c. of 10 per cent formalin is added.

3. **Pus.**—When in sufficient quantity and a culture has to be made, pus should be forwarded in a sterile specimen

tube. When gonococci are suspected, several films are made on glass slides by taking the pus direct from the lesion with a platinum loop.

4. **Sputum.**—If cultures are to be made or animals are to be inoculated, it is desirable for the patient to expectorate direct into a sterile sputum specimen bottle, and, of course, no antiseptic should be added.

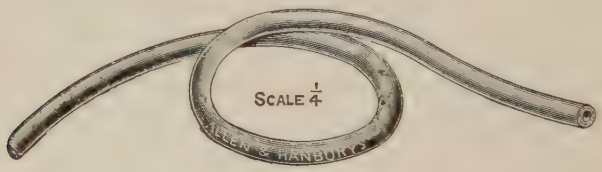
5. **Urine.**—For cultural work a catheter specimen is absolutely necessary, and the urine should be forwarded in a sterile specimen tube. When sugar estimation has to be done, a sample of a twenty-four hours' specimen should be sent, and during the collection of this a few drops of toluol may be added as a preservative.

6. **Fæces.**—When typhoid or dysentery is suspected, it is essential that fresh specimens should be sent immediately they are obtained. Samples of fæces left overnight are practically useless for cultural examination, as a negative result cannot be relied upon. A specimen taken in the early morning is preferable. The sterile bottle supplied for the purpose usually has a small spoon fixed in the cork. When typhoid carriers are suspected, the second or third stool after calomel administration is necessary; this will contain bile from the gall-bladder, where typhoid bacilli are apt to lurk.

7. **Throat Culture.**—The child lies down, and an assistant grasps both his wrists with one hand and steadies the forehead firmly with the other. The operator then inserts a tongue depressor with the left hand, and with the right one gently rubs the wool-coated end of the wire-swab over each tonsil. The wool stopper is removed from the culture tube, and the swab rubbed lightly on the surface of the culture medium. The stopper is then replaced, after it has been ignited in the spirit flame to sterilise it. The swab should not be allowed to come in contact with anything but the area which is being investigated.

XV. Use of the Flatus Tube.

A collection of gas in the lower bowel can often be removed by the use of a flatus tube. This is a rather stiff rubber tube, usually about 30 in. long, open at the end. A bowl of warm lotion, in which to immerse the outer end of the tube, is required; also some vaseline, a macintosh, and a linen square. The tube is warmed in the lotion.



Flatus Tube.

and well lubricated. It is then passed into the rectum cautiously, a few inches at a time, lest it damage the wall of the intestine or fold back on itself. It can often be passed in for 20 in., and is generally left in about fifteen minutes, the outer end being kept in the bowl of lotion so that it can be noticed whether flatus is passed.

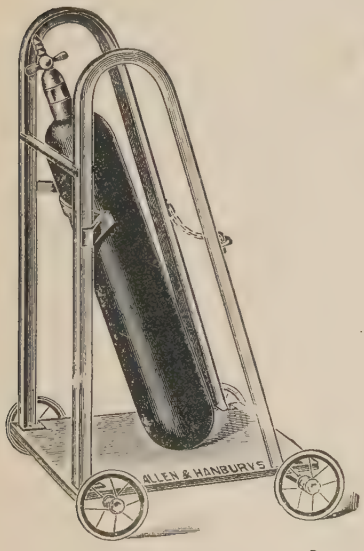


Glycerine Injection Syringe.

XVI. Administration of Oxygen.

Oxygen gas is a respiratory and cardiac stimulant, and relieves dyspnœa. It is best given moist and warm, as it tends to make the mucous membrane dry. The cylinder of oxygen is connected by rubber tubing with one side of a Wolff's bottle (half filled with hot water or hot brandy),

the other side of which is attached by rubber tubing to either a funnel, held 6 to 8 in. from the face, or a catheter through the nose, or a nozzle in the mouth, or a special mask covering nose and mouth. If a catheter through the nose is used, it should be a fine one, and be smeared lightly with cocaine ointment (2 per cent) before being passed. The gas should be turned on so that bubbles can just not be counted in the Wolff's bottle, and should be given for ten to fifteen minutes at a time. A new cylinder should be opened outside the ward, as the first rush of gas may alarm the patient.



Oxygen Cylinder and Stand.



Wolff's Bottle.

CHAPTER VIII.

BATHS AND PACKS.

I. Cold Baths, Etc.

Cold water, when applied to the skin, stimulates the internal organs, as is shown by its effect upon the heart in cases of fainting. Similarly, in typhoid it increases the activity of those glands which are engaged in destroying the poison of the disease, thus leading to a more rapid removal of it from the system. It also acts as a sedative to the nervous system, lessens delirium, and induces sleep. Further, it is a stimulant to the heart, and braces up the circulation. At the same time, by lowering the temperature, it tends to diminish wasting.

We may say, then, that cold water, when used externally in the treatment of fever, produces the following beneficial effects—

(*a*) The removal of *toxins* from the system is hastened.
(*b*) *Pyrexia* is diminished.
(*c*) *Delirium* is lessened
(*d*) The *circulation* is improved.
(*e*) *Wasting* is lessened, and nutrition improved.

The systematic use of cold water in the treatment of disease is usually reserved for cases of enteric fever. In other illnesses, as a rule, it is only applied when the temperature is sufficiently high to have an injurious effect upon the patient.

Before giving any sort of bath, a nurse should obtain exact

instructions as to the temperature of the bath, and the length of time the patient is to be kept in it. To follow out the former of these two instructions to the letter, she must never be without her bath thermometer.

Cold may be used in the treatment of fever in one of the following ways—

1. **Cold Bath.**—This is undoubtedly the most efficacious. At the same time, it is more or less of a shock to the patient, and for that reason is seldom used in this country, except when the immediate lowering of a dangerously high temperature is desired.

A long bath, half full of water at a temperature of about 65° F., is placed transversely at the foot of the bed. A small towel is fastened round the patient's hips, his head and neck are sponged with cold water, and he is carefully lowered into the bath on a sheet. When first placed in the water, he gasps for breath and shivers, but this gradually passes off. While in the water, his skin should be subjected to firm yet gentle friction by the nurse's hands. He should be removed from the bath if shivering is uncontrollable, cyanosis appears, or the pulse becomes small and feeble. If these symptoms persist after removal, he should be given a hot drink and be rubbed down with a hot towel.

After ten minutes a blanket is thrown across the top of the bath, and the towel removed from the hips. The patient is then lifted out by placing the hands behind him, and leaving the wet sheet in the bath. Still covered by the blanket, he is laid upon another on his bed, and rapidly dried. Half an hour later, his pulse and temperature should be taken. In this country, at any rate, a medical man is usually present when a cold bath is given.

In a private house, where there is no portable bath, the following method may be used—

A long macintosh is placed beneath the patient, and the ends and sides raised by means of rolled-up blankets, large bath towels, or pillows. The patient now lies in a macintosh bath, so that water can be squeezed freely on to his

body from a large sponge without any risk of wetting the bed. While this is being done with one hand, his skin must be rubbed with the other.

2. **Tepid Bath gradually Cooled.**—This is more pleasant than the cold bath, and, being less of a shock, can be used in cases where the other might prove dangerous. It is always used for children in preference to the cold bath.

The patient is prepared exactly as for the cold bath. The temperature of the water to begin with should be about 90° F. From this point, by the gradual removal of the warm water and addition of cold water or small pieces of ice, it is slowly reduced to 70°. While the bath is being given, the water must be frequently moved about by the nurse's hand, so as to keep the temperature of the whole as even as possible. It is seldom necessary or desirable to keep him in longer than fifteen to twenty minutes, as his temperature will continue to fall for a short time after removal from the bath.

If the patient is a child, he can be carried to the bath-room, where giving a graduated bath is a very simple matter. Very young children should not be kept in the bath longer than ten minutes, nor should the temperature of the water be reduced for them below 80°. The nurse should support the back with one hand, and sponge the chest with the other.

3. **Cold Pack.**—The bed-clothes are first taken off the patient, and a blanket thrown over him. A large macintosh covered by a blanket is then slipped under him, a small towel fastened round his hips, and his night-shirt removed. Two large sheets are taken, and each folded once lengthways and once crossways, thus making four thicknesses, and then wrung out of cold water (65° F.). One of these is placed under the patient, and the two sides of it brought up to the front of the body between the arms and ribs, and also tucked round the thighs and legs. The other sheet is then laid on the front of the body, tucked round the neck and also beneath the body on each side, passing on

the outer side of the arms. It is important that the pack should be closely adapted to the whole of the trunk, and not separated from it by the arms. This is much easier of attainment with two sheets than with one. The feet are usually left uncovered. If the patient shivers much, a hot bottle may be applied to them. Covered with one blanket, he is left in the pack for five minutes. At the end of that time the sheets are separately removed, again wrung out of cold water, and reapplied. This process is usually repeated at least four times. When taken out of a cold pack, the patient is treated in the same way as after a cold bath. Hot bottles and warm drinks are only given if he continues to shiver or remains very cold.

When a cold pack is given with the object of relieving violent delirium rather than for the reduction of a high temperature, the sheets are not changed. The patient is thoroughly wrapped in two blankets and kept in the pack for about an hour, or longer if he should fall asleep.

Another plan is to combine the cold pack and the cold affusion. The sheets, having been once applied, are kept cold by sprinkling the patient with water from a small watering-pot, or rubbing him with ice. This can be done every three or four minutes, front and back, until the temperature, as taken in the mouth, has fallen to the required point.

4. **Cold Sponging.**—For performing this small operation a nurse needs a bath thermometer, a basin of water at a temperature of 65° F., another containing small pieces of ice, a small sponge (one about the size of a large orange is quite big enough), a blanket, and two bath towels or draw-sheets. The blanket is slipped under the patient, his night-shirt removed, and the bed-clothes taken off, with the exception of one blanket which is turned down as far as the hips. The towels or draw-sheets are then tucked closely against each side of him, passing to the neck behind the shoulders, so as to catch the water which runs off him in the process of sponging. The blanket will protect the bed against any which escapes the towels.

The sponge should be so wet that each time it touches the patient a few drops of water escape from it. This is a much more efficacious method than placing the patient under a blanket, and stroking him in sections with an almost dry sponge. The chest and abdomen must be freely exposed during the whole of the sponging, and, by a series of light strokes, kept constantly wet. The operation should last for *at least ten minutes*. It is hardly worth while sponging the limbs; but the back can easily be done, by turning the patient on to his side and rearranging the towels. Before the back is sponged, the front of the chest should be dried. During the operation the temperature of the water will be kept at, or a little below, 65° by the addition of ice. Sponging a patient by this method produces the minimum of disturbance with the maximum of effect. It is but seldom, however, that one is able to effect a greater reduction of temperature by sponging than 1½° to 2°.

Hot Sponging.—It may be well to mention here that instead of using cold water, some physicians order patients who are suffering from high fever to be sponged with water at a temperature of 110° F. The object of this method is to dilate the vessels in the skin, and so bring a large quantity of blood to the surface of the body, where it will be exposed to the cooling influence of the air. It is especially indicated in the eruptive fevers when the temperature is high, the pulse weak, and the rash dusky and ill-developed. In such a case hot sponging will lower the temperature, stimulate the circulation, and bring out the rash.

Tepid sponging is frequently used for checking the profuse night-sweats of phthisis.

5. **Cradling.**—This is the least efficacious method, but can be used with practically no disturbance of the patient.

The bed-clothes are taken off, and a blanket folded over the feet and legs as high as the knees. Two large body-cradles are then placed over the patient. These are covered by a sheet which is tucked in at the sides of the bed, but folded back at the foot and top, so that, though the patient

is in no way exposed, a free current of air may pass through beneath the cradles. The night-dress is now drawn up. The patient may be left for some hours in this position, till the temperature, which should be taken every hour, has fallen sufficiently. If the temperature shows no signs of coming down, three or four ice-bags may be hung inside the cradles. These must not touch the patient, and should be wrapped in lint to prevent any dripping of water. Another method is to cover the cradles with a sheet wrung out of iced water. If the feet become cold, a hot bottle may be applied.

II. Hot Baths and Packs.

The application of heat to the surface of the body produces dilatation in the vessels of the skin, and therefore increases largely the quantity of blood which they contain. This extra supply has been drawn from the muscles and internal organs. Now, in health, the more blood there is passing through any part of the body, the more food does that part obtain, and therefore the greater is its activity or power of work. Conversely, a diminished supply of blood to a part means less work for that part to do. Hot baths and packs, by drawing blood from the deeper structures to the surface of the body, are therefore useful in the following conditions :—

(*a*) *Inflammation of the Kidneys.*—By diminishing the amount of blood that is passing through the kidneys, hot baths lessen the work of those organs, and therefore give them a better chance of recovery. At the same time, by increasing the blood supply of the skin, they increase the flow of perspiration. When the kidneys are inflamed the sweat-glands relieve them of a portion of their work, and remove from the blood certain of those poisonous waste substances which in health should be discharged in the urine.

(*b*) *Muscular Spasm.*—When the blood supply of a muscle is diminished, its functional activity is at the same time

depressed. Hence, if it has previously been contracting so energetically as to cause pain, a hot bath will help to stop such painful contractions. Thus is explained the beneficial effect of a hot bath in colic. Infantile convulsions are relieved in a similar way.

(*c*) *Insomnia*, apart from such a cause as pain, is due to a too persistent activity of the brain. It will not stop working, and hence the individual to whom it belongs is unable to sleep. A hot bath, by drawing blood from the brain to the surface of the body, lowers the activity of that organ, and conduces to sleep.

(*d*) *Pain.*—Hot baths exert a soothing influence upon the nervous system, and thus diminish pain. They are useful in chronic painful affections of joints, nerves, and muscles, and also in some forms of abdominal pain.

1. **Hot Bath.**—The temperature of a hot bath may vary from 100° to 110° F., or even higher. To begin with, it should not exceed 100°. After the patient has been lifted in, its temperature should be raised very gradually, by the addition of hot water, to the degree ordered. The temperature of the bath should always be tested by a thermometer.

When used for the relief of pain, it is best to give the bath at the bedside. After remaining in for about ten minutes, the patient is taken out, quickly and lightly dried, and put to bed in a warm blanket. An hour should elapse before the blanket is removed.

When the hot bath is given to promote sleep, the patient is taken out at the end of five minutes, thoroughly and quickly dried with a couple of warm towels, and put comfortably to bed in a warm night-dress.

If the case is one of kidney disease, the patient should remain in the water from five to ten minutes after the thermometer has registered 110° F. He is then quickly removed to his bed, and, without being dried, rolled up in a hot blanket which has been previously laid there. Another warm blanket is then wrapped closely round him, especially about the neck, hot bottles put in the bed, and the bed-clothes replaced. Cold water should be given the

patient to drink after removal from the bath, as this encourages in a marked degree the secretion of sweat. After remaining in the blankets for about an hour, the patient is gradually uncovered, sponged with tepid water, dried with warm towels, taken out of the wet blankets, and put to bed. As this is a very exhausting method of treatment, the patient must be carefully watched for any sign of faintness or prostration, to prevent which a cloth wrung out in cold water may be kept on the head during the bath.

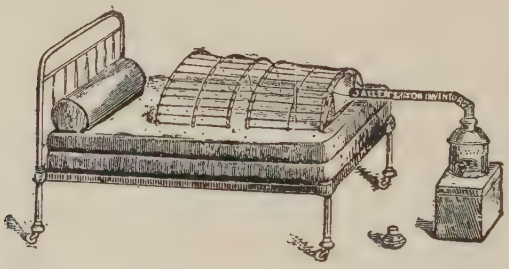
When the bath is given to produce muscular relaxation, the patients are generally children suffering from convulsions or spasmodic croup. The child should be immersed to the neck, while cold water is squeezed out of a sponge over the head. Hot water should be added to the bath very carefully, as a child's skin is much more tender than an adult's, and will not stand a higher temperature than 103° to 105° F.

2. **Vapour Bath.**—For giving this, Allen's apparatus is the most convenient, but an ordinary bronchitis or croup kettle may be used. Before commencing to give any form of hot bath or hot pack, the windows on each side of the patient's bed should be closed.

A macintosh and blanket are first placed beneath the patient and his night-shirt taken off. A small blanket folded double is next laid over him, the bed-clothes are removed, and two body-cradles of wickerwork arranged so as to cover the whole body from the shoulders down to the feet. The cradles are covered with a blanket, that with a macintosh, and that again with a second blanket. The object of the macintosh is to prevent the escape of hot air. The blankets are now well tucked in, especially about the neck and shoulders. Then from the foot of the bed is drawn away the blanket that was folded over the patient, and the spout of the kettle placed just within the lowermost cradle. A piece of damp flannel bandage should always be wrapped round the spout, otherwise the blankets which are pinned round it may be scorched. The kettle may be heated either by spirit-lamps or by gas. Care must

be taken that hot water does not drip from the nozzle of the bronchitis-kettle on to the patient. This is prevented by hanging a small tin on to it, or by the use of absorbent wool, or a small blanket may be placed across the legs. Allen's apparatus has a special shield for the steam to strike against. This is hung on the outside of the lowermost cradle. A cloth wrung out of iced water should be laid on the patient's forehead, and frequently changed while the bath lasts. At the same time, cold water should be given him to sip, as it encourages the flow of perspiration.

A vapour bath, when given to an adult, usually lasts for about fifteen minutes after the skin has begun to act,



Hot Air and Vapour Bath.

regard being had to the patient's condition and the nature of his illness. It is important that the nurse should frequently test the temperature of the bath with a bath thermometer, placing it above the patient's body where she will find it very much hotter than it is on the bed. It should not be allowed to rise above 120° F., and 115° F. is usually high enough. Some medical men prefer to have the patient wrapped in a blanket during the bath. It would be safer always to treat young children in this way.

When the bath is finished, the kettle is first removed. Then the small folded blanket, which should be very warm, is put under the cradles from the top, and pushed as far down as possible. Then, going to the foot of the bed, the nurse passes her hand beneath the cradles, and draws the

blanket down, so that it completely covers the patient. This is to prevent any risk of burning the patient, when the heated blankets fall on him as the cradles are removed. With a dropsical patient and very hot blankets this accident might otherwise happen. With as little disturbance as possible the cradles and macintosh are then withdrawn, and the bed-clothes allowed to fall quietly upon the patient. These coverings should be allowed to remain some time, the blankets both below and over the patient, as they get wet with perspiration, being from time to time replaced by warm dry ones. When the skin has ceased to act, the patient should be sponged with tepid water, rubbed down with hot towels, and a warm night-shirt put on.

Either a vapour or a hot-air bath can be given to a patient sitting in a chair beside his bed. A chair with a wooden bottom, the seat and back of which should be covered with a blanket, is taken, and the kettle arranged so that the spout projects beneath the chair. It should be placed at one side of the chair, so that the steam does not play on the patient's legs. The patient, whose night-shirt has been removed, is then, from the chin downwards, closely enveloped in blankets, which pass from the front of him round to the back of the chair. They are carefully pinned round the nozzle of the kettle, so as to exclude cold air and prevent the escape of warm. The after-treatment has been already described. If a hot-air bath is to be given, the funnel and boiler are removed, and the rest of the bath with the lighted lamp inside placed underneath the chair.

3. **Hot Air Bath.**—This is usually given nowadays by suspending electric lamps to cradles placed over the patient, who is arranged in the same way as for a vapour bath. If electric lamps are not available, Allen's apparatus, minus the boiler, may be used. The duration of the bath depends upon the ease with which perspiration is induced, the condition of the patient, and the nature of his illness. If he is standing it well, he may be kept in for about fifteen minutes after his skin has begun to act.

As regards the temperature, it is impossible to give definite instructions, since it varies so much in different parts of the bath, and a high degree of dry heat can be tolerated with impunity. The nurse must test it frequently with her hand, and at the same time be guided by the sensations of the patient. If he is perspiring freely, one or more of the lamps may be put out. While in either a hot-air or a vapour bath, the patient should never be left, but should be most carefully watched. At the first sign of exhaustion or faintness, the lamps must be put out and the cradles removed.

At the completion of the hot-air bath, he is treated in the same way as after a vapour bath.

4. **Hot Wet Pack.**—The patient is prepared in the same way as for a cold pack. Two light small-sized blankets are then thoroughly wrung out of water as hot as the hand can bear, and carried to the bedside wrapped in a warmed draw-sheet. There they are applied in the same way as the sheets in a cold pack, after which the under blanket and rubber sheet are brought up in turn from each side and tucked under the opposite side. Finally another blanket is laid on the patient and tucked in firmly all round him, and the bed-clothes are then replaced. In a short time profuse perspiration ensues. At the end of half an hour, which is the time usually ordered, the patient is rapidly sponged with tepid water, dried with a hot towel, and put into bed. A *mustard pack*, given in the same way, is valuable for children suffering from diarrhœa and vomiting. The water is prepared at 90°-100° F. with ½-1 oz. mustard to the gallon. The pack is removed in a few minutes when the skin is well reddened.

5. **Dry Pack.**—The patient is closely wrapped up in several hot blankets, hot-water bottles placed round him, and left for as long as the physician has ordered. The dry pack is another very efficient promoter of profuse perspiration. After the pack the patient is sponged, dried, and put to bed.

This form of pack is always used when a hypodermic

injection of *pilocarpine* is given, a drug which quickly causes copious sweating. It also depresses the heart, and the patient must therefore be carefully watched while under its influence.

Before leaving the subject of hot baths it will be, perhaps, as well briefly to enumerate the principal points which a nurse should bear in mind when giving one of them :—

(*a*) The temperature of the bath must be gradually raised, and constantly watched.

(*b*) The patient must be neither scalded nor burnt.

(*c*) The bath must be stopped on the first sign of faintness.

(*d*) The patient must be carefully guarded from cold air, both during and after the bath.

(*e*) He must not be left alone while in the bath.

(*f*) A wet compress or an ice-cap should always be applied to the head of a patient who is having a hot bath or a hot pack.

III. Miscellaneous and Medicated Baths.

Under this heading will be mentioned various baths which are used in the treatment of disease, which differ both in their mode of application and object from those previously described.

1. **Continuous Bath.**—This bath is used for extensive burns, certain forms of skin disease, and large wounds with much sloughing and offensive discharge. It acts by keeping the injured surface constantly clean, thus putting it in the best possible condition for repair. The bath, which may last for some days, should be kept as nearly as possible at 100° F. A water-cushion is placed at the bottom of the bath for the patient to rest on. A support for the head is made by arranging some pieces of webbing or bandage across the upper end of the bath, and on that laying an air-cushion. To retard the escape of heat, the bath should be covered with a long macintosh sheet and a blanket. It must be kept at an even temperature by the abstraction

and addition of an equal quantity of water at least every half-hour. Three times a day, or more often if necessary, the patient must be lifted out, wrapped in a warm blanket, and placed on her bed that she may use the bed-pan ; twice during that time the water should be entirely changed. A thermometer must be kept constantly in the bath. It should be suspended from the side, so that it hangs in the water. The patient, particularly if a child, should never be left alone while in a bath.

2. **Local Baths.**—These are hot baths, acting upon a limited area of the body.

(*a*) *Arm and Leg Baths.*—These are given in special trough-shaped baths, and are generally used for foul wounds. The bath should be half filled with water at 100° F., and, after adding to it the lotion which is ordered, carefully arranged on the bed with sand-bags or pillows, so that it is comfortable, and cannot easily be overturned. The arm is then laid in it, and the bath covered with a small blanket to hinder cooling. If the leg is to be immersed, a divided mattress may be used, and the lower portion taken away to allow of the bath being sufficiently low, the sound limb being supported on pillows ; or the bath may be stood on a chair beside the bed. A small pad should be placed between the edge of the bath and the limb, which should be supported on slings of muslin or domette. The water should be changed every hour. If the limb is very painful, the water can be siphoned off ; by doing this, all disturbance of the patient will be avoided.

(*b*) A *Hip Bath,* or *sitz bath,* as it is sometimes called, is most useful in cases where there is disease of the pelvic organs. It is used to induce menstruation, and to relieve the pain of dysmenorrhœa and hæmorrhoids. The bath must not be filled too full. The temperature of the water ought to be about 105° F. A blanket should be arranged round the patient and bath, so that the upper part of the former may not be chilled, nor the temperature of the latter lowered, while a second blanket is wrapped round the legs.

(*c*) *Foot Bath.*—This is sometimes used for sprains, but more frequently in the hope of checking a commencing catarrh. In such a case mustard is often added to the bath. The temperature of the water should be about 110° F., and the feet be kept in it for ten minutes, the legs and bath being covered with a blanket.

3. **Mustard Bath.**—This is sometimes used in cases of convulsions, spasmodic croup, or measles when the rash has not developed properly; also for young children when collapsed after severe diarrhœa.

An ounce of mustard should be used for every five gallons of water. Some physicians prefer to have it double this strength. The mustard is put into a muslin bag, from which it is squeezed out when put into the water, or it may first be thoroughly mixed with a little warm water and afterwards added to the bath: it should never be sprinkled on the surface of the water. As this form of bath is generally used for children, the temperature, starting at 100°, should not rise above 105° F. The nurse will support the child in the bath, and remove it when her own arms begin to tingle.

4. **Mercurial Vapour Bath.**—To give this, a patient must have a vapour bath when sitting upright in a chair. A small dish containing the amount of calomel prescribed is placed over a spirit-lamp under the chair. The calomel is converted by the heat of the lamp into vapour, which is carried upwards by the steam, and deposited upon the patient's body. When all the calomel has disappeared, the bath is stopped, a warm flannel nightgown put on, and the patient placed in bed. The calomel must not be wiped off, otherwise no benefit would follow upon its use. This method of administering mercury is now rarely adopted.

5. **Sulphur Bath.**—For every gallon of water which is going to be put into the bath, take from an eighth to a quarter of an ounce of sulphuret of potassium. Dissolve this amount in boiling water, and add to the bath, the temperature of which should rise from 100° to 110° F. This bath is used in some skin diseases.

6. **Iodine Bath.**—This is used to stimulate slow-healing ulcers, and may be given as a partial or local bath. To every gallon of hot water one-sixth of an ounce of tincture of iodine is added.

7. **Bran Bath** is prepared by boiling 2 to 4 lb. of bran in a gallon of water, straining, and adding the infusion to an ordinary hot bath. While in the bath the patient should not be rubbed. If it is necessary to moisten the face, it should be dabbed with a very wet sponge.

8. **Alkaline Bath** is prepared by adding 6 oz. of carbonate of soda or potash to a hot bath. This bath is usually given for rheumatism, or to relieve the itching of skin eruptions. The patient must be very gently handled, and not hurried or chilled.

CHAPTER IX.

HOT AND COLD APPLICATIONS, AND COUNTER-IRRITANTS.

One of the commonest of a nurse's duties is the application of a fomentation or an evaporating lotion to an inflamed or painful part. Both of these remedies have for their object the hastening of repair in the inflamed part, as well as the relief of pain. A clear understanding of their method of action will not only render their use more interesting, but will prevent the mistake nurses usually fall into of supposing that, if in a particular case a hot application does good, it necessarily follows that a cold one will do harm. For information on this subject the chapter on Inflammation should be consulted.

I. Hot Applications.

When applying heat of any kind, a nurse must take particular care in the case of patients who are completely or partially unconscious, or are suffering great pain, or have dropsy, or are paralysed in any way, or subject to fits. Any of these conditions may lessen the patient's sense of external discomfort; and an exhausting and slow-healing wound may be produced by the incautious application of too great heat.

Hot applications may be either moist or dry. The former are the more efficacious, their influence penetrating farther

and lasting longer; while the latter can be borne at a higher temperature.

1. **Poultices** are of various kinds, and may be made of almost any sort of meal that will retain heat and moisture.

(*a*) *Linseed Poultice.*—Crushed linseed is most commonly used for a poultice. The oil which it contains is useful both as an emollient and as a retainer of heat. To make the poultice, a nurse requires a poultice-board (in a private house she may have to be satisfied with brown paper), a suitable bowl, a strapping-can, a spatula or a long, flat, pliable knife, together with the tow or linen on which the poultice is to be spread. If tow is used, it should be pulled out so as to lie flat and even.

Half fill the basin with boiling water, then fill the strapping-can and put the spatula in it. When the basin is quite hot, empty it, and putting in a sufficient quantity of water, add the linseed quickly, sprinkling it with one hand while stirring with the spatula. When it is sufficiently firm and free from lumps, and comes clean away from the edge of the dish, turn it out on the linen or tow, and spread evenly and quickly with the spatula, dipping the latter in the strapping-tin between the strokes. The layer of linseed-meal should be a quarter of an inch deep for the chest and half an inch deep for the extremities, and it should be spread to within 1 in. of the edge of the linen or tow, when the former should be folded and the latter rolled in all round. It should be carried to the patient doubled on itself, and rolled in hot wool or between two hot plates. Care should be taken that it is not applied too hot. To assure herself that it is of the right temperature, the nurse should apply the back of her hand to it. If any of the linseed adheres to her hand, the poultice has been badly made, and should be discarded. When the poultice has been placed in position, it is covered with a thick layer of cotton wool, extending an inch beyond it in every direction, and secured by a bandage. A fresh poultice is rolled on as the old one is removed, for the skin must not be exposed to chill; or the skin may be dried with a warm towel

and covered with wool and blanket until the new poultice is applied. A linseed poultice is usually changed every four hours. Sanders recommends that it should be taken off at the end of two hours and a layer of hot wool put on until the next poultice is due. Sometimes a piece of muslin is laid over it, or the surface is rubbed with warm olive-oil, to prevent it adhering to the skin. If the poultice has been well made, neither of these precautions is necessary; oil should only be used if the skin is much reddened, while muslin interferes with the action of the poultice.

A jacket poultice should be made on linen, and in two halves, one for the front, the other for the back of the chest. After being covered with wool, it is secured in place by a many-tailed bandage with shoulder straps. The linseed should never be more than a quarter of an inch thick, otherwise its weight increases the already existing difficulty of respiration.

(*b*) *Bread Poultice.*—This is not very often used, as it does not retain the heat for any length of time. A sufficient quantity of stale bread-crumbs is mixed with boiling water, and allowed to stand for ten minutes in a vessel which is placed in boiling water. It is then well stirred up with a fork, the water poured off, and more boiling water added. This is left for about a minute and then drained off, the poultice being now spread and applied. It should be changed very frequently, as it quickly cools and cakes. To prevent the bread-crumbs adhering to the skin, the latter should be rubbed with some simple ointment, or warm oil spread over the poultice.

(*c*) *Mustard Poultice.*—This is a very common and most useful form of poultice. The proportion of mustard to linseed varies with the age of the patient and the object of the poultice, and is usually from one-tenth to one-sixth, though if it is being used for the relief of pain in an adult, a larger quantity of mustard may be used, the application being removed at the end of fifteen or twenty minutes. The linseed is mixed with water in the usual way, and the

mustard then stirred into it. A layer of fine muslin is placed on the poultice before it is applied.

This poultice is intended to redden the skin, not to blister it, and the nurse must be very careful that the latter effect is not produced. After removing it, the part should be dried, and the skin carefully examined to see that no particles of mustard are adhering to it. It is then dusted with powder and covered with cotton wool, or a plain linseed poultice applied, according as the nurse has been directed. This should be done quickly and thoroughly, as exposure to the air intensifies the irritating and stinging effect of the mustard.

When a poultice is finally omitted, the part should be covered for two or three days with a thin layer of cotton wool.

2. **Fomentations or Stupes.**—This is the cleanest and most convenient form of locally applying moist heat. If used for the relief of urgent pain, fomentations should be changed every twenty minutes. They are frequently left on for two hours at a time, but unless they are very carefully covered in by wool and bandaged closely to the skin, they become chilly and uncomfortable long before that period has elapsed. The best material for a medical stupe is soft old flannel; for a surgical fomentation sterile lint and absorbent wool are used. At least two thicknesses of the material, if it be flannel or lint, are required. A stupe-wringer is advisable, though a towel is sometimes used instead. The wringer is made of ticking or stout towelling, 18 in. long and 10 wide, with a broad hem at each end, through which is passed a stout piece of wood the shape of a ruler. For a *medical fomentation* the wringer is laid in a basin, and the two thicknesses of flannel are spread out on it. Boiling water is then poured over it, after which, by twisting the two pieces of wood in opposite directions, the fomentation is wrung out quite dry. If any superfluous moisture is left in it, it cannot be borne so hot by the patient, and is likely to scald him. The fomentation is carried to the bedside in the wringer. It is there taken

out, shaken to admit air between its folds, and put on as hot as the patient can bear. It is then covered over with another piece of flannel or jaconet, which must be an inch longer in every direction than the fomentation. Over this a thick layer of wool is placed, and the whole bandaged firmly in position. The wool is used to keep the heat in the fomentation, not to prevent the escape of fluid, since this in a properly made fomentation practically does not exist. A *surgical fomentation* is made in the same way, except that it is advisable to boil the lint folded in the wringer in a saucepan, and use sterile forceps in applying it after wringing.

Turpentine Stupe. — This is prepared as follows: One to two teaspoonfuls of turpentine are sprinkled on the flannel, which is then folded and the boiling water poured over it. After wringing, the flannel is unfolded and the surface on which the turpentine was sprinkled applied to the patient. A more even distribution of the turpentine is possible by this method than by sprinkling the drug on the fomentation after the latter has been wrung out. The edge should be turned up every ten minutes, and the stupe should be removed as soon as the skin is well reddened. It is not, as a rule, repeated, but is followed by a simple fomentation or warm cotton wool. After removing it, the nurse should look carefully for any spot that is especially red or is blistered, and should cover such spots with small pieces of lint spread with simple or other ointment; or, if the skin is very red, dust it with zinc and starch powder. Turpentine stupes are never used in cases of kidney disease.

Mustard Stupe.—This stupe may be made by thoroughly mixing two tablespoonfuls of mustard with a pint of warm water, and, having dipped the flannel in it, wringing it out; or a teaspoonful of mustard may be sprinkled between two layers of flannel that have been wrung out of hot water.

Opium and *belladonna* are sometimes applied on stupes, a half to one teaspoonful of the tincture being sprinkled on

the flannel after it has been wrung out, or glycerine of belladonna may be spread on the painful part and a simple fomentation put on. As some people are peculiarly susceptible to the influence of belladonna, the nurse should carefully note and report any dilatation of the pupils or complaint of dryness of the throat, both of which symptoms point to a slight degree of belladonna-poisoning.

Hot Sponges may be used to foment the face or throat. They should be wrung dry, applied as hot as possible, and changed continually. Such a fomentation can only be used for a short time.

The nurse must exert some ingenuity in cutting the fomentation, so that it may accurately fit the part to which it is to be applied. In fomenting the breast, the flannel should be round, with a hole in the centre for the nipple, and slit out one side so as to fit comfortably without rucking.

3. **Hot Dry Applications.**—

(*a*) *Hot Bottles* are made of aluminium, earthenware, or indiarubber. An earthenware bottle should be filled with boiling water ; if it is made of indiarubber the water should not be boiling or the bottle will be damaged. A hot bottle should always be entirely encased in a thick flannel bag, which must have no holes in it and be quite dry, or the patient may be burnt. Care must be taken that the bottle does not leak, and that, when it is put into the bed, it does not tend to roll and rest against the patient. Nothing reflects greater discredit on a nurse, or is more annoying to her, than to have to report a *burn* produced by a hot bottle. Particular care should be taken in the case of children, and patients who are unconscious or paralysed. These should be kept under frequent observation by the nurse, and the bottle always placed outside the inner blanket, and, if possible, tethered by a bandage to the bed frame or a cradle. Hot bottles should be changed at frequent intervals, and, if possible, without disturbing the patient.

(*b*) *Hot Wool* or flannel is often used for inflamed joints, or for abdominal discomfort or pain. A thick piece of

brown cotton wool or flannel is toasted in front of the fire, or heated in the oven between two plates. It must be changed frequently, and if the patient is restless, lightly secured in place by a bandage.

(*c*) *Hot Bran Bag.*—Two soft muslin bags are half filled with bran. One is put in the oven between two plates, and, when sufficiently warm, applied, being afterwards covered with hot wool. The second is got ready against the time that the first is removed. Bran bags are light and comfortable when heat is required for a limited period ; but, as they do not long remain warm, they become troublesome.

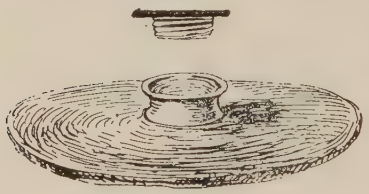
Salt- or hop-bags are made and heated in the same way.

(*d*) *Pneumonia Jacket* is used for children with bronchitis or broncho-pneumonia, when a linseed poultice is unnecessary, and it is merely desired to keep the chest warm ; or it may be used after a poultice has been taken off. It is cut out in soft muslin, or linen, which is double, and between the two layers is laid a single sheet of brown wool. The edges are lightly quilted and tacked down. The back and front are fastened together down one side and across one shoulder, the other side and shoulder being secured by tapes.

II. Cold Applications

Are most useful during the early stages of an inflammation, since they tend to check the process by their contracting influence upon the blood-vessels, and consequent diminution in the escape of their contents. Great care, however, is necessary to see that they are cold, and that an iced compress does not, by neglect on the part of the nurse, become converted into a lukewarm fomentation. When this happens, more harm than good has been done by the use of cold ; for during the reaction which necessarily follows, there is a great increase in the quantity of blood flowing to the part, and as a result a further advance in the process of inflammation.

1. **Ice-bags** are made of various shapes and sizes to suit the part to which they are to be applied. The most useful is the cap-shaped ice-bag. This should be half filled with small pieces of ice, with which may be mixed a little common salt to intensify the cold; or sawdust may be added, since this, by soaking up the water, makes the ice last longer. The less air the bag contains, the better. A single fold of lint should always be placed between the patient's skin and the ice-bag, which should, if possible, be suspended from a cradle so that its whole weight is not borne by the patient. The bag must be refilled before all the ice is melted, otherwise it merely becomes a receptacle for lukewarm water. Two ice-bags should be used, so that the bag which needs changing may be immediately replaced by a fresh one.



Ice-bag.

2. **Ice Poultice.**—This may be made in the following way: Take a double thickness of gutta-percha tissue a little larger than the area to be covered. Cover the lower leaf of the tissue with a thin layer of linseed-meal, or wood-wool, and upon it place ice, crushed small, to the depth of half an inch. Sprinkle the ice with common salt, and on the top of it add another layer of linseed-meal or wood-wool. Turn the upper leaf over the lower, and then seal the edges with chloroform or turpentine. Put the poultice into a flannel bag, and place under it a fold of lint.

3. **Iced Compress.**—Three thicknesses of lint are cut to a suitable size and shape, and squeezed out of the iced lotion between two flat wooden discs connected by a hinge, or they may be wrung dry in the same way as a fomentation. This is done to avoid the heat of the hand. If a bandage is required to keep them in position, as when the eye is being treated, a single turn is all that is required. A block of ice should stand in a bowl beside the bed, with another

compress ready to replace the one in use. They should be frequently changed, and require unremitting attention to be effective.

4. **Evaporating Lotions.**—A single fold of lint is used, and the part to which it is applied left exposed, so that evaporation may be accelerated. To put on jaconet and a bandage is a great blunder, since the application straightway becomes converted into a fomentation, producing exactly the opposite effect to that which was intended. Frequent changing is necessary to ensure that the lint remains moist, or if it is on a part like the knee, it is better to drop lotion on the lint. To keep the bed dry, a draw-



Leiter's Tubing.

sheet and a macintosh should be placed under the part that is being treated.

5. **Leiter's Tubing** is metal tubing, the coils of which are arranged either in the shape of a cap, so that it can be easily applied to the head, or in other forms designed to suit the part of the body for which it is to be used. From the upper end of it a rubber tube leads into a can of iced water. From the other end similar tubing runs to a receptacle on the floor. By means of a clip on the upper piece of rubber tubing, the speed with which the water passes through the coil can be exactly regulated. To start the water running, the nurse holds the upper end of the topmost piece of rubber tubing firmly in her left hand,

while she passes the thumb and first finger of her right hand down the whole length of it, squeezing it firmly as she does so. This will expel the air, so that when the left hand relaxes its hold water will rush into the tube, and the right hand now releasing the lower end, the apparatus begins to work.

III. Counter-Irritants.

Counter-irritants are local applications used for the relief of pain and to promote the absorption of inflammatory products. By drawing blood to that part of the skin to which they are applied, they diminish the supply to the deeper structures, such as the muscles and the internal organs which lie beneath their point of application.

1. **Mustard Plaster** is much stronger than a mustard poultice. To one part of fresh mustard add one of flour, and make into a paste with tepid water. Spread evenly on a piece of linen cut to a suitable shape and size, and cover with a single layer of washed muslin and apply. It should be left long enough (ten to fifteen minutes) to redden thoroughly, but never to blister, the skin. If necessary, it may be secured in place with a bandage. Less mustard and more flour may be used; this would be advisable in the case of a child. If the patient is unconscious, or in great pain, the nurse must carefully watch the effect of the plaster, or a troublesome sore may result. After the plaster has been taken off, she should carefully wipe the skin, to remove any particles of mustard that may be adhering to it, dust with starch powder, and cover with wool and a bandage.

2. **Mustard Leaves** may be used instead of the plaster. They are more convenient, being always prepared and ready to hand at any chemist's; but they are somewhat uncertain in their action, and are liable to produce such an extreme degree of discomfort as to necessitate their re-

moval before any good effect has had time to follow their application. The part should first be washed, the mustard leaf moistened in warm water, and kept in place by wool and a bandage. In the case of children, or people with sensitive skins, the surface of the leaf should be covered with a layer of washed muslin, to diminish the irritation. For such patients a moderately weak mustard plaster is preferable. When the mustard leaf is removed, the part should be dusted with starch or other powder, and covered with wool.

3. **Iodine** is painted on with a camel's-hair brush. After the first coat has dried, a second should be applied. In the case of children one is enough. If the iodine treatment is ordered to be continued for some time, the part to be painted should be divided into three or four sections and one only treated each day. The continuous daily application of iodine to the same area of skin very soon hardens it so much that further use of the remedy is without effect. When painting the knee or the elbow, the bony prominences of the patella and the olecranon should not be included.

4. **Antiphlogistin** is a patent clay containing glycerine, menthol, and methyl salicylate. To apply, soften by standing the tin in boiling water, spread thickly on lint, cover with warmed wool, and bandage. A hot bottle may be placed in contact with it. Remove in 12-24 hours when dry, and wash skin with soap and water.

5. **Liniments** are very mild counter-irritants which are rubbed in by hand after the part has been washed. Rubbing should be continued until the part is fairly dry and the skin red and glowing. They usually have an oil or soap basis, and contain turpentine, ammonia, or camphor.

6. **Blister.**—This is a much more severe form of counter-irritation, since actual inflammation in the shape of a blister is set up. Cantharides, the Spanish blistering fly, is the agent used. It may be applied as a plaster or painted on the part.

When the *plaster* is used, the part should be well washed with soap and water, and sponged with ether to remove grease from the skin. The plaster having been cut to the size and shape required, is moistened with warm water, placed in position, covered with wool, and secured with a bandage.

When *blistering fluid* is used, the part to be painted should be outlined with oil, to keep the counter-irritant within bounds. Two or three coats are then painted on, each one drying before the next is applied, and the part covered with wool and a loose bandage.

The plaster should be left on for about ten hours, or in the case of a child half that time. It is then very carefully removed, and, if vesication is slight or absent, a poultice or fomentation applied. The bleb which has been produced is snipped at its lowest point with a pair of sharp clean scissors, and the fluid gently pressed out with absorbent wool. It is then dusted with powder and some cotton wool bandaged on it.

7. **The Actual Cautery.**—The instrument usually employed is that invented by a French surgeon named Paquelin. As a counter-irritant it may be used—

(*a*) *For the relief of pain*, in which case the heated point is not brought into contact with the skin, but is moved to and fro in close proximity to it, so as to produce a reddening of the surface. In place of the cautery a hot laundry iron may be used to relieve the pain of lumbago, &c. A piece of thick brown paper is laid on the skin and the iron passed several times lightly over it until the skin becomes red. The iron must only just touch the paper.

(*b*) *For the treatment of chronic joint inflammation.*—Here the point of the instrument, being kept at a dull red, is lightly drawn across the part to be treated, so as to produce a superficial burn, which is dressed in the ordinary way.

8. **Leeches.**—The relief of pain and the checking of inflammation are the proper uses for leeches; they are also often placed over the liver in cases of advanced heart

disease. Each leech withdraws from one to three drachms of blood. The smaller pointed end is the head of the animal.

Before applying a leech, the part should be washed with an unscented soap, which is removed with warm water. The skin is afterwards well rubbed with a towel, so that the blood may be brought to the surface. The leech should be handled as little as possible, otherwise it will take longer to bite. Its box may be simply inverted over the area to which it is to be applied, and retained there until it has bitten, or it may be allowed to crawl out on to a clean folded towel, and thence be directed on to the skin. In the latter case it is prevented from wandering by placing over it a medicine measure, or a wine-glass. If the leech refuses to bite, placing a drop of milk on the skin will often prove efficacious. For nervous patients it is a good plan to place a piece of lint over the part from which blood is to be drawn, with a small hole cut in it through which the leech can bite. Its body will then not come in contact with the skin.

When a leech is ordered to be applied in the neighbourhood of the eye, it is placed in a test-tube half full of cotton-wool, which should be held over it until it has commenced to suck, and then gently slipped away. When applied to the interior of the nose, mouth, or vagina, a thread should be passed through the tail. This controls its movements, and does not interfere with its working.

A leech will continue sucking for about three-quarters of an hour. It should never be forcibly removed, otherwise its teeth may be left in the skin. A pinch of salt on the head will always make a leech relax its hold. If bleeding is to be encouraged, a fomentation should be applied to the bites. Occasionally a firm pad and bandage, or touching with nitrate of silver stick, is necessary to arrest the bleeding.

After removal, a leech should be destroyed, as it will be a long time before it is fit for work again. If it is desired to keep it, it should be placed in a plate of salt to make it vomit the blood it has taken, and afterwards put into a jar

of water with sand or fine gravel at the bottom, and a perforated lid, the water being changed daily at first, and subsequently once a week. A leech-bite always leaves a small triangular scar.

9. **Cupping** may be performed in two ways—viz., the dry and the wet. Both operations have for their object the drawing of blood from the deeper parts to the skin; but while the dry method leaves the blood in the skin, the wet allows it to escape into a cup by means of small incisions.

(*a*) For *dry cupping* cupping-glasses, or, failing them, port-wine glasses are necessary, some methylated spirit, and a box of matches. The rim of the cup is first smeared with vaseline, or wet with water to prevent it becoming unpleasantly hot. Next a little spirit is smeared over the inside of the cup with a small sponge, made of any absorbent material held in a pair of dressing forceps, or a wisp of wool wrapped round a probe. A light is then applied, and just before the flame dies out the cup is quickly applied to the affected part. The heated air in the cup, as it cools, contracts and draws upon the skin, which is sucked up into the cup so as to make a distinct swelling. The cups are generally left on for about three or four minutes, and should always be taken off before anything like bruising has been produced. When removing them, the nurse should press the skin down at the edge of the cup with the tip of her finger, so as to let air enter the cup, when it will easily come off. This method of treatment is most commonly used in inflammation of the kidneys, the cups being applied to the loins.

(*b*) In *wet cupping* the skin is carefully cleansed with soap and an antiseptic, and several small incisions are then made in it with a scalpel, or a special instrument called a scarificator, before the cup is applied. This is then done in exactly the same way as for dry cupping. Blood is sucked out of the small cuts into the glass.

CHAPTER X.

PHARMACOLOGY AND THERAPEUTICS.

All medicines should be kept in a cupboard, the key of which is in the possession of the sister or head nurse of the ward. All poisons should be carefully labelled. The liniments and lotions should stand on a shelf by themselves, poisons like morphine and strychnine on another shelf, while a third is occupied by the ordinary everyday medicines. If this rule is always observed, and the cupboard kept constantly locked, there is no excuse for administering a poison by mistake.

I. Medicines and their Administration.

Drugs may be introduced into the system in several different ways.

1. **By the Mouth.**—The great majority of medicines are given by the mouth, and hence are absorbed into the blood from the stomach or intestines, and by it carried to the organ which it is intended to affect. Drugs given in this way may be administered in the form of mixtures, pills, or powders, or in capsules.

(*a*) *Mixtures.*—Before giving a dose of a mixture, the nurse should never omit to read the label, however confident she may be that she has got the right bottle. Even if there is only that one bottle in the room, she should still do so, that there may be no risk of the habit being broken.

Having read the label and shaken the bottle, she should pour the exact dose into a graduated medicine-glass. It must never be guessed, and spoons are not reliable measures. When a certain number of drops are to be given, a minim measure should, if possible, be used, since drops vary very much in size with the character of the fluid and the shape of the bottle. While pouring out the medicine, the bottle should be held with the label uppermost, that this may not be soiled if any drops should run down the side.

(*b*) *Pills* contain drugs in a solid form. When they reach the stomach they break up and are absorbed. Sometimes it is desired that they should not break up until they reach the intestines, and they are therefore coated with a special material which the gastric juice is not able to dissolve.

There are two objections to the use of pills. In the first place, unless they have been recently made they become so hard and dry that sometimes they pass entire through the stomach and intestines, and appear in the stools. Secondly, some people cannot swallow a pill, and the smaller it is the less likely are they to be able to do so. Even after water has been drunk, it still remains at the back of the throat. This difficulty is frequently overcome by eating a mouthful of bread, which sweeps the pill down with it. As a last resort, the pill may be crushed or cut into small pieces.

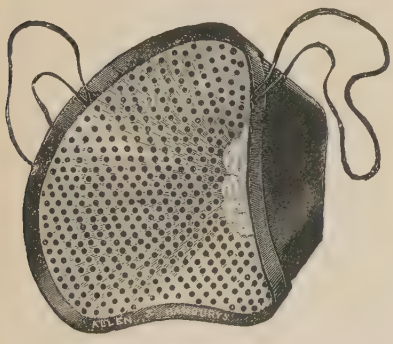
(*c*) *Powders.*—These should be shaken on to the back of the tongue, and then washed down with a drink of some fluid. If the powder has a very disagreeable taste, it may be given in a capsule, or wrapped up in a rice-paper wafer. Quinine should be dropped on the surface of an ounce of milk, and at once taken.

(*d*) *Capsules* are small pear-shaped receptacles made of gelatine, which are sealed up after having a dose of the drug placed in them. They are easily swallowed, and the gelatine, like the rice-paper wafer, is at once dissolved by the gastric juice

2. **By the Lungs.**—Given in this way drugs are inhaled—*i.e.*, drawn with the air at each inspiration into the lungs, where they settle upon the lining membrane of the air-sacs and bronchial tubes, from which they are absorbed by the blood-vessels. Inhalations are useful in sore throat, and when the larynx is inflamed. They are given in one of the following ways :—

(*a*) The drug is dropped upon a piece of sponge, wool, or lint, which is placed in a *wire respirator* to be worn by the patient over his mouth.

(*b*) The drug is placed in an *earthenware inhaler*, together



Yeo's Inhaling Respirator.



Nelson's Inhaler.

with a pint of water at a temperature of 150° F. The patient places his lips to the glass mouthpiece, and, breathing only through the mouth, draws into his lungs at each inspiration the vapour, and with it the essence of the drug.

Or the hot water and drug may be placed in a vessel with a wider opening, such as a basin or jug, so that the patient may inhale through the nose as well as the mouth. This is a very useful method in the treatment of an ordinary cold in the head.

(*c*) The drug may be administered by means of a *Siegel's spray*, which throws upon the patient's mouth a fine cloud

of steam and the medicated solution, which he consequently breathes in at each inspiration.

(*d*) Certain drugs, such as chloroform, ether, &c., are inhaled for the purpose of producing anæsthesia. Nitrite of amyl, which is put up in glass capsules containing from two to five minims, is used, especially in angina pectoris, to dilate the blood-vessels and so lower the blood pressure. The capsule is broken in a handkerchief, and the vapour inhaled.

3. **Hypodermic Injections.**—By this method the drug to be administered is injected under the skin. "Under the skin" is the meaning of both "hypodermic" and "subcutaneous." Absorption into the circulation is very much more rapid by this way than by either of the others, the drug, if it is going to produce any effect, doing so within from one to five minutes of the time of injection. Being such a potent method, it is, as a rule, used only in cases of emergency, when we wish at once to relieve pain, induce vomiting or sweating, or stimulate the heart.

All nurses should learn the proper use of the hypodermic syringe (see p. 149), since at any time they may be called upon to give an injection.

4. **Rectal Medication.**—Drugs are given in this way when the patient is unconscious or vomiting, or for the relief of diarrhœa or rectal pain, or to stimulate a patient collapsed after operation. As a rule the quantity given is double the ordinary dose, since it is not likely that the whole of it will be absorbed. *Liquid preparations* should be run in by means of the apparatus recommended for the administration of nutrient enemata. Opium is the drug that is most commonly administered in this way in combination with starch. *Suppositories* are small cone-shaped bodies which contain drugs in a solid form. They are usually made of cacao butter, which melts at once from the heat of the rectum, into which they are introduced, pointed end first, after lubrication (see p. 209).

5. **Inunction** means the rubbing of an ointment into

the skin. The portion to be treated should first be washed and dried, to stimulate the circulation in the skin so that it may the more quickly absorb. Mercurial ointments are used in syphilis, and cod-liver oil in marasmus. The ointment should be rubbed *into* the skin, and not left on it ; the patient may do it himself, thoroughly massaging the part by means of the palm and finger tips. It should take from twenty minutes to half an hour to rub in the usual dose. In the case of children, the nurse must wear rubber gloves and do it. The insides of the arms and thighs, the calves, and the sides of the chest and abdomen, are the best sites for inunction. The same place should not be used on successive days, lest the skin become inflamed. Inunction is usually performed at bedtime. The patient should wear a flannel night-gown, take a warm bath in the morning, and use a mouth-wash and tooth-brush frequently.

Plasters,—*e.g.*, belladonna plaster—are cut to the required size, snipped at the edges to prevent creasing, warmed, applied to the skin after washing and drying, and bandaged in position if necessary.

6. **Ionisation,** or **Kataphoresis,** is a method of introducing drugs into the body by means of electricity. Zinc sulphate, lithium iodide, potassium iodide, and sodium salicylate are the drugs which are most often used in this way.

7. **Insufflation.**—Powders are sometimes applied locally by being blown on to the part.

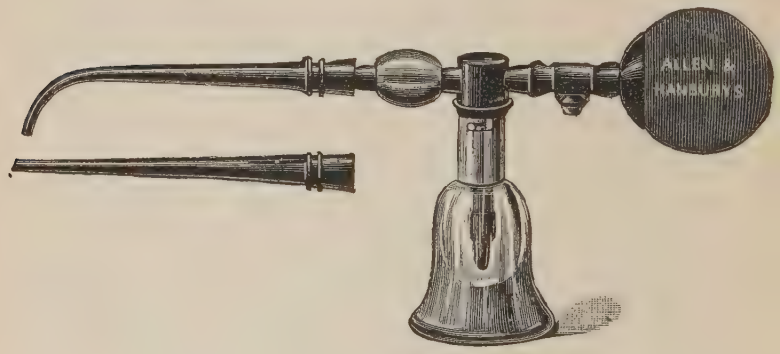
When to give Medicines.—Drugs, such as *arsenic* and *cod-liver oil*, which might possibly cause nausea, are given shortly after a meal, as the stomach, being busy with the food, is then less likely to take offence at them.

Alkaline mixtures are usually given a quarter of an hour before food. If taken soon after a meal, they neutralise some of the acid gastric juice, and so tend to interfere with the process of digestion. Taken on an empty stomach, they are very quickly absorbed into the circulation. *Acid*

mixtures are best taken from fifteen to thirty minutes after a meal.

Purgatives are given so that they may stimulate the bowel about the time when an action should normally take place—viz., after breakfast. Thus pills, which are slow to act, are administered at bedtime; while a Seidlitz powder, or mineral water, is best taken half an hour before breakfast, as the stomach and intestine being empty at that time, it is quickly absorbed, and rapidly produces an action of the bowels.

To disguise Unpalatability.—If the medicine is very



Insufflator.

unpalatable, sucking a piece of ice or a peppermint-drop beforehand, or drinking cold water, will partially get over the difficulty by numbing the nerves of taste in the mouth; or the nose may be pinched while the dose is being swallowed.

Castor-oil and *cod-liver oil* may be given to adults in the following way if their medicines have to be made as nice as possible for them. A teaspoonful of sherry, or a small quantity of lemon-juice, is poured into a wine-glass, which is tilted so that the liquid runs all round it; this will prevent the oil sticking to the glass. The oil is then poured in carefully, so that the edges of the glass are

not touched by it, and on it is placed another teaspoonful of sherry or more lemon-juice. The following method may also be tried. Put the oil into a small quantity of strong lemonade, and at the bedside stir in a little baking soda; if the mixture is drunk while effervescing, no oily taste will be perceived. For children the oil may be placed in a bottle with an ounce of milk and a pinch of sugar, the mixture being heated and then well shaken; as a result the oil mixes intimately with the milk, and is taken without difficulty.

II. Prescriptions.

A prescription begins with the sign **R.** (an abbreviation of *recipe*, take), followed by the names and quantities of the drugs ordered. Then come the directions to the dispenser, for example, **mist. ft.** (*mistura fiat*, let a mixture be made); **m.** (*misce*, mix); *mitte doses tales viij* (send eight such doses). Next, the directions to the patient, headed by **S.** (*signa*, write). Lastly, the patient's name, the date, and the prescriber's initials.

Certain abbreviations and signs are allowed, for example:—

(*a*) *Re* time of administration: **t.d.s.** (*ter die sumendum*, to be taken three times a day); **b.d.** (*bis die*, twice a day); **stat.** (*statim*, immediately); **n.** (*nocte*, at night); **h.n.** (*hac nocte*, to-night); **o.n.** (*omne nocte*, every night); **m.** (*mane*, in the morning); **c.m.** (*cras mane*, to-morrow morning); **n. et m.** (*nocte et mane*, night and morning); **alt. die.** (*alternis diebus*, every other day); **p.r.n.** (*pro re nata*, as occasion requires); **s.o.s.** (*si opus sit*, if necessary); **a.c.** (*ante cibos*, before food); **p.c.** (*post cibos*, after food).

(*b*) *Re* quantities of drugs: **q.s.** (*quantum sufficit*, a sufficient quantity); **ss.** (*semis*, a half); **ad lib.** (*ad libitum*, at pleasure); **o.** (*octarius*, a pint); **coch.** (*cochleare*, a spoonful); **m.** (*minim*, a minim); **c.c.** (a cubic centimetre); **aa** (*ana*, of each); **ad** (up to).

(*c*) *Re* nature of preparation: **ung.** (*unguentum*, ointment); **pulv.** (*pulvis*, a powder); **gutt.** (*gutta*, a drop); **ol.** (*oleum*, oil); **haust.** (*haustus*, a draught); **mist.** (*mistura*, a mixture); **troch.** (*trochiscus*, a lozenge).

(*d*) Various: **aq. dest.** (*aqua destillata*, distilled water); **ex aq.** (*ex aqua*, in water); **s.v.r.** (*spiritus vini rectificatus*, rectified spirit); **s.v.g.** (*spiritus vini gallici*, brandy); **co.** (*compositus*, compound).

III. Weights and Measures.

Imperial System :—

Weights—

437½ grains (grs.)	= 1 ounce (oz.) (*Avoirdupois*)
7000 grains or 16 ounces	= 1 pound (lb.) („)
20 grains	= 1 scruple (℈ i) (*Apothecaries'*)
3 scruples (60 grains)	= 1 drachm (ʒi) („)
8 drachms (480 „)	= 1 ounce (℥i) („)

Fluid Measures—

60 minims (m1x)	= 1 fluid drachm (ʒi)
8 fluid drachms	= 1 fluid ounce (℥i)
20 fluid ounces	= 1 pint (Oi)
8 pints	= 1 gallon (Ci)

Metric System :—

Weights—

1 milligram (mg.)	= one-thousandth part of a gramme (gm.)
1 centigram (cg.)	= one-hundredth „ „
1 decigram (dg.)	= one-tenth „ „
1 kilogram (kilo.)	= 1000 grammes

Length—

1 millimetre (mm.)	= one-thousandth part of a metre (m.)
1 centimetre (cm.)	= one-hundredth „ „
1 decimetre (dm.)	= one-tenth „ „
1 kilometre (km.)	= 1000 metres

Fluid Measures—

1 cubic centimetre (c.c.), or 1 mil	= the measure of 1 gm. of distilled water at 4° C.
1 litre	= 1000 c.c.

The metric system is very convenient in dispensing; for example, a 5 per cent watery solution is one in which 5 grammes are dissolved in 100 cubic centimetres of water.

Conversion of Scales.—The Imperial and Metric scales are readily converted from one to the other, if it is remembered that—

1 gramme = 15½ grains (*i.e.*, ʒi is slightly over 4 gms.
1 cubic centimetre = 17 minims.
1 litre, or 1000 c.c. = 35¼ fluid ounces, or slightly over 1¾ pints.
1 metre = 39⅓ inches.

Domestic Measures.—As the size of both drops and spoons varies considerably, these measures are not sufficiently accurate to be used when measuring drugs. A drop approximately measures 1 minim; a teaspoonful, 1 fluid drachm; a tablespoonful, ½ fluid ounce; a wineglassful, 2 fluid ounces.

Calculation of Dose.—Some nurses have great difficulty in working out the dose of a drug which is contained in solution when so many grains of the drug are ordered instead of so much of the solution.

A mixture, for instance, contains 30 grains of chloral in each ounce, and the patient is ordered to have 10 grains given him if he does not sleep. Now, 10 is the third part of 30; to get 10 grains he must, therefore, have the third part of an ounce of the mixture—*i.e.*, the third part of 8 drachms—viz., 2⅔ drachms, or 2 drachms and 40 minims.

A solution contains 25 grains chloral in each fluid ounce, and 10 grains are ordered. It is obvious that there are 5 grains in ⅕ fluid ounce, and, since the dose ordered is twice this quantity, the answer is ⅖ fluid ounce—*i.e.*, 3 drachms 12 minims.

Again, a mixture is said to contain one grain of chloral in each 8 minims—*i.e.*, the patient must take 8 minims to get one grain. If he is ordered 15 grains, the nurse must give him 8 times 15—*i.e.*, 120 minims of the mixture; in other words, she must multiply the number of grains

ordered by the number of minims in which each grain is dissolved.

A patient is ordered a hypodermic injection of $\frac{1}{10}$ grain morphine, to be prepared from a $\frac{1}{4}$ grain tablet. If you dissolve the tablet in 20 minims sterile water, each minim will contain $\frac{1}{80}$ grain, and you inject 8 minims. If you dissolve it in 10 minims water, each minim will contain $\frac{1}{40}$ grain, and you inject 4 minims.

Percentages.—A 5 per cent (5%) aqueous solution is one that contains 5 grains of the drug in every 100 grains (110 minims) of water; a 10 per cent solution one that contains 10 grains in that amount of water. 20 per cent is thus twice as strong as 10 per cent, and 10 per cent twice as strong as 5 per cent. To convert a 10 per cent solution into a 5 per cent one it must, therefore, be mixed with an equal quantity of water or other diluent.

The Dilution of Lotions.—If we take 1 pint of a lotion containing 1 fl. oz. of carbolic acid in each 20 fl. oz. of the solution, and add to it another 20 fl. oz. of water, we get a lotion containing 1 fl. oz. of carbolic acid in each 40 fl. oz. of the solution, or, as we say, it is of the strength of 1 in 40 (*i.e.*, 1 part of the acid in 40 parts of the lotion), and is therefore half the strength of the 1 in 20. If, on the other hand, we add 40 fl. oz. of water, we make it 1 in 60, or one-third the strength of the 1 in 20.

Thus, to prepare a weaker solution from a stronger, the nurse should *first divide the figure representing the weaker by that representing the stronger solution, and afterwards divide, by the figure thus obtained, the number of ounces of lotion she is going to make.* The result will give the amount of the stronger solution she is to use. For example, to make 2 pints of 1 in 1000 from a solution of 1 in 200. First divide 1000 by 200. The result is 5; that is, one-fifth of the new solution is to consist of the original solution. One-fifth of the new solution required (2 pints or 40 fl. oz.) is 8 fl. oz. She is, in other words, to take 8 fl. oz. of the 1 in 200 solution and add to them 32 fl. oz. of water to make 2 pints of 1 in 1000.

IV. Action of Drugs.

1. **Aperients** may be divided into—

(*a*) *Laxatives*, which slightly increase the action of the bowels by stimulating their muscular coat—*e.g.*, certain foods (whole meal bread, honey, treacle, figs, prunes, stewed apples), liquid paraffin, sulphur, and manna.

(*b*) *Simple purgatives*, which are more powerful, stimulating peristalsis and increasing secretion—*e.g.*, aloes, rhubarb, cascara sagrada, and senna leaves or pods.

(*c*) *Cathartics*, which greatly increase secretion and peristalsis, often causing griping pain unless combined with hyoscyamus—*e.g.*, jalap, colocynth, scammony; also calomel, and croton oil ($\frac{1}{2}$ to 1 minim).

(*d*) *Salines*, which increase the passage of fluid from the tissues into the intestines—*e.g.*, magnesium sulphate (Epsom salts) and other salts of magnesium, sodium sulphate (Glauber's salts), and sodium phosphate. They are found in most purgative mineral waters.

The purgatives most commonly ordered before and after operation are castor-oil (1 oz.), magnesium sulphate ($\frac{1}{2}$ oz.), and calomel (3 grains) followed by white mixture or a Seidlitz powder. In convalescence, one or other of the following is generally used: syrup of senna ($\frac{1}{2}$ to 2 drachms), compound liquorice powder (60 to 120 grains), syrup of figs ($\frac{1}{2}$ to 2 drachms), colocynth and hyoscyamus pill (4 to 8 grains), aloin pill ($\frac{1}{2}$ grain), liquid extract of cascara sagrada (1 drachm), Epsom salts, mineral waters, &c.

2. **Anthelmintics** are drugs which kill parasitic worms in the alimentary canal—*e.g.*, felix mas (for tapeworm), santonin (for roundworm), rectal injection of salt water or infusion of quassia (for threadworm).

3. **Expectorants** promote the secretion of the air-passages, and aid its expulsion. *Stimulating expectorants* are stimulants to the circulation generally—*e.g.*, senega,

squill, balsam of tolu, and terebene. *Depressing expectorants* depress the general circulation—*e.g.*, ipecacuanha, antimony salts, and potassium iodide.

4. **Emetics** are used for the production of vomiting—*e.g.*, apomorphine, tartarated antimony (tartar emetic), ipecacuanha, sodium chloride, and mustard.

5. **Gastric Tonics,** or **Stomachics,** increase the activity of the gastric juice—*e.g.*, aromatics, pungent substances (pepper, mustard, horse-radish), meat extracts, alcohol, dilute mineral acids (hydrochloric, nitric, sulphuric, phosphoric), and bitters (gentian, quassia, calumba, cinchona, quinine).

6. **Gastric Sedatives** are employed in painful forms of dyspepsia—*e.g.*, carbonate, subnitrate, and salicylate of bismuth, diluted hydrocyanic acid, ice, belladonna, hyoscyamus, and opium.

7. **Cardiac Tonics.**—The drugs most used for their action on the heart are digitalis, squill, and strophanthus, which increase the force of the contraction, and slow the pulse; and caffeine and alcohol, which increase both the force and the number of beats.

8. **Antipyretics** lower the temperature in fever—*e.g.*, phenacetin, phenazone (antipyrin), acetanilide (antifebrin), quinine, acetyl-salicylic acid (aspirin), and salicin. Antipyrin and antifebrin are dangerous because of the collapse they may produce. Phenacetin is very safe, but less powerful. Quinine and salicin are rather uncertain.

9. **Diuretics** increase the quantity of urine secreted—*e.g.*, caffeine, scoparium, buchu, potassium citrate, and urea, all of which act on the renal cells; and digitalis, squill, strophanthus, and alcohol, which act through the circulation. Diuretics are used in cardiac and pulmonary diseases when the quantity of urine falls below the normal; also in pleural effusion and ascites.

10. **Diaphoretics** increase the amount of perspiration —*e.g.*, pilocarpine, ammonium acetate, potassium citrate, and opium They are used especially in uræmia.

11. **Hypnotics** induce a sleep closely resembling natural sleep—*e.g.*, chloral hydrate, bromides, chloralamide, chloretone, sulphonal, trional, and paraldehyde.

12. **Narcotics** are substances which produce an abnormally deep sleep—*e.g.*, opium, morphine, and most hypnotics in excessive doses.

13. **Anæsthetics.**—General anæsthetics are drugs which lead to complete loss of consciousness, so that pain is no longer felt and reflex action is abolished—*e.g.*, chloroform, ether, and nitrous oxide. Examples of local anæsthetics are cocaine, eucaine, and novocain.

14. **Nerve Stimulants.**—Some general cerebral stimulants are taken habitually—*e.g.*, alcohol, tea, coffee, and tobacco in England; opium in the East; cannabis indica in parts of Asia; and coca in parts of South America. Nux vomica and its alkaloid strychnine are the drugs most often employed in medicine.

15. **Uterine Stimulants** are used in cases of inertia of the uterus—*e.g.*, ergot, by mouth or hypodermically; and pituitrin or adrenalin chloride solution hypodermically.

V. Dosage.

The *adult* dose is that for a person between 20 and 60 years old. In *children under 12* a common rule is to add 12 to the age, and divide the age by the number thus obtained. Thus, for a child aged 8, the dose will be 8 divided by 8+12, or two-fifths of an adult dose. *Between 12 and 20* the dose is proportionate to the age. *Above 60 years*, the dose should be diminished.

The dose of the *hypodermic injections* of the British Pharmacopœia—viz., those of apomorphine, cocaine, ergot, morphine, and strychnine—is 5 to 10 minims. These drugs, and certain others, are often dispensed either in solution of other strengths, or in tablet form, the adult doses for hypodermic injection being as follows:—

Adrenalinum	gr. $\frac{1}{200}$ – $\frac{1}{50}$
Apomorphinæ Hydrochloridum	gr. $\frac{1}{20}$ – $\frac{1}{10}$
Atropinæ Sulphas	gr. $\frac{1}{200}$ – $\frac{1}{100}$
β-Eucainæ Lactas	gr. $\frac{1}{8}$ – $\frac{1}{2}$
Cocainæ Hydrochloridum	gr. $\frac{1}{10}$ – $\frac{1}{4}$
Hyoscinæ Hydrobromidum	gr. $\frac{1}{200}$ – $\frac{1}{100}$
Morphinæ Hydrochloridum	gr. $\frac{1}{8}$ – $\frac{1}{4}$
Pilocarpinæ Nitras	gr. $\frac{1}{20}$ – $\frac{1}{5}$
Strychninæ Hydrochloridum	gr. $\frac{1}{64}$ – $\frac{1}{16}$

The following are drugs in common use with their doses when given to adults by mouth :—

Acidum Acetyl-salicylicum (*Aspirin*)	gr. 5 – 15
" Hydrocyanicum Dilutum	min. 2 – 5
Ammonii (vel Potassii, vel Sodii) Bromidum	gr. 5 – 30
Barbitonum (*Veronal*)	gr. 5 – 10
Bismuthi Carbonas, vel Salicylas, vel Subnitras	gr. 5 – 20
Chloral Formamidum (*Chloralamide*)	gr. 15 – 45
Chloral Hydras	gr. 5 – 20
Diamorphinæ Hydrochloridum (*Heroin Hydrochloride*)	gr. $\frac{1}{25}$ – $\frac{1}{8}$
Extractum Ergotæ Liquidum	min. 10 – 30
Hexamina (*Urotropine*)	gr. 5 – 15
Hydrargyrum cum Creta (*Grey Powder*)	gr. 1 – 5
Liquor Adrenalini Hydrochloricus	min. 10 – 30
" Arsenicalis (*Fowler's Solution*)	min. 2 – 8
" Hydrargyri Perchloridi	dr. $\frac{1}{2}$ – 1
" Morphinæ Hydrochloridi	min. 10 – 60
" Strychninæ Hydrochloridi	min. 2 – 8
Methyl-sulphonal (*Trional*)	gr. 10 – 20
Oleum Ricini (*Castor-oil*)	dr. 1 – 8
Paraffinum Liquidum	dr. 1 – 4
Paraldehydum	dr. $\frac{1}{2}$ – 2
Phenacetinum	gr. 5 – 15
Pilula Saponis Composita (containing Opium)	gr. 2 – 4
Potassii Chloras	gr. 5 – 15
" Iodidum	gr. 5 – 20
Pulvis Ipecacuanhae Compositus (*Dover's powder*, containing Opium)	gr. 5 – 15
Pulvis Jalapæ Compositus	gr. 10 – 60
Quininæ Hydrochloridum, vel Sulphas	gr. 1 – 10
Salicinum	gr. 5 – 20
Santoninum	gr. 1 – 3
Sodii Salicylas	gr. 10 – 30

Spiritus Ammoniæ Aromaticus (*Sal volatile*)	single dose	min. 60 – 90
Strychninæ Hydrochloridum		gr. $\frac{1}{64}$ – $\frac{1}{16}$
Sulphonal		gr. 10 – 30
Syrupus Chloral		dr. $\frac{1}{2}$ – 2
" Ferri Phosphatis cum Quinina et Strychnina (*Easton's syrup*)		dr. $\frac{1}{2}$ – 1
Tinctura Belladonnæ		min. 5 – 15
" Camphoræ Composita (*Paregoric*)		dr. $\frac{1}{2}$ – 1
" Digitalis		min. 5 – 15
" Hyoscyami		dr. $\frac{1}{2}$ – 1
" Iodi Mitis		min. 2 – 5
" Nucis Vomicæ		min. 5 – 15
" Opii (*Laudanum*)	single dose	min. 20 – 30
" Quininæ Ammoniata		dr. $\frac{1}{2}$ – 1
" Strophanthi		min. 2 – 5
Vinum Ipecacuanhæ (as expectorant)		min. 10 – 30

NOTE—*Vel* means "or"; *et*, "and"; *cum*, "with"; *mitis*, "weak"; *oleum*, "oil"; *vinum*, "wine"; *compositus*, "compound"; *hydrargyrum*, "mercury."

Suppositories.—Sup. Acidi Carbolici (1 gr. carbolic acid); Acidi Tannici (3 gr. tannic acid); Belladonnæ (contains about $\frac{1}{60}$ gr. alkaloids); Glycerini (70% glycerine, in several sizes to suit age); Morphinæ ($\frac{1}{4}$ gr. morphine hydrochloride); Iodoform (3 gr. iodoform); Plumbi Co. (contains lead acetate and about 1 gr. opium).

VI. LOTIONS IN COMMON USE.

For use these lotions are usually diluted with an equal quantity of water:—

Lotio Acidi Borici: boric acid crystals 320 grains, hot water 1 pint; dissolve, and when cold pour off the clear solution.
Lotio Acidi Carbolici: often coloured pink; strength 1 in 20.
Lotio Alkalina: sodium bicarbonate and borax, of each 1 per cent.
Lotio Calaminæ: calamine, zinc oxide, glycerin, and water.
Lotio Evaporans (spirit lotion): methylated spirit and water.
Lotio Formaldehyde: formalin, 1 in 500.
Lotio Hydrargyri Nigra (black wash): mercurous oxide, glycerin, and water.
Lotio Hydrargyri Perchloridi: coloured blue; strength 1 in 1000.
Lotio Lysol: liquor cresol saponatus; strength 1 in 50.
Lotio Plumbi (lead lotion): lead subacetate.

Lotio Plumbi cum Opio (lead and opium lotion): tincture of opium and lead lotion.
Lotio Plumbi Evaporans: methylated spirit and lead lotion.
Lotio Rubra (red lotion): zinc sulphate and compound tincture of lavender.

VII. Symptoms of Over-Dosage.

Some people, owing to their extreme susceptibility to a drug, are at once poisoned by it in a way that could not possibly have been anticipated. Again, certain drugs, of which digitalis is the best example, after being taken for some time, all at once produce symptoms of poisoning. They are said to have a "cumulative" action—*i.e.*, they gradually accumulate in the system until one day a certain limit is reached, and symptoms are suddenly produced. On the other hand, some drugs, of which opium is the best example, after a time gradually lose their effect, so that the dose has to be correspondingly increased, till at last the patient tolerates doses which it would have been highly dangerous to give him when he first began to take the drug.

In the following list the symptoms given are not those which would follow a poisonous overdose of each drug, but only such as might arise during its medicinal administration:—

Alcohol.—Reference is here made only to the use of alcohol as a stimulant in cases of illness, such as enteric fever. If restlessness and delirium become more marked, the tongue more dry, and the pulse more rapid in a patient who is not used to alcohol, such as a woman or a child, there is a possibility that the drug is to a certain extent responsible for these symptoms.

Antifebrin and Antipyrin, when given even in small doses, produce in some people symptoms of collapse, as shown by palpitation and faintness.

Arsenic in large doses, as in chorea, may injuriously affect the nerves of the arms and legs, causing those members to become paralysed. It may also produce vomiting and pain in the epigastrium.

Bromide of Potassium, when given for a lengthened period, as is usually done in cases of epilepsy, tends to produce muscular weakness and nervous depression, while sometimes a pustular rash appears on the face and trunk.

Belladonna and *Atropine*, which is its active principle, produce in people who are very susceptible to their influence a dry throat, dilatation of the pupils, and sometimes a red rash like that of scarlet fever. In more severe cases delirium and convulsions supervene.

Carbolic Acid.—The first symptom of poisoning by this drug is a dark olive-green colour of the urine.

Chloral in some people dangerously depresses the action of the heart, and slows the respiration.

Digitalis, after being administered for some time, occasionally produces sudden symptoms of depression and faintness, accompanied by vomiting and slowing of the pulse. This condition is more likely to come on when the patient is sitting up. Any one who is taking large doses of digitalis should therefore be kept in the recumbent or semi-recumbent position. Diminution in the quantity of urine passed is often an indication of over-dosage. The urine should therefore be measured in the case of patients taking digitalis.

Iodide of Potassium in some people very readily produces running from the eyes and nose, and less often a rash on the face, trunk, and limbs.

Mercury after a time tends to produce swelling and inflammation of the gums, with loosening of the teeth and fœtor of the breath. With this there is a metallic taste in the mouth and an increased flow of saliva. A nurse should most carefully watch for these symptoms.

Nux Vomica and Strychnine.—Strychnine is the active principle of nux vomica, just as morphine is of opium. After being taken for some time, these drugs in some patients produce muscular twitching, which is an indication for discontinuing the medicine.

Opium and Morphine.—Very young children are most easily poisoned by even a very small dose of these drugs.

Minute contraction of the pupils, and great difficulty in rousing the child, show that it is being dangerously affected by the opium. The same symptoms may occur in adults whose kidneys are diseased, or who are in the later stages of acute pneumonia.

Quinine in some people readily produces headache, deafness, and singing in the ears, while more rarely a very irritable rash follows its administration.

Sodium Salicylate frequently produces transient deafness and singing in the ears. These symptoms, though trying to the patient, are not necessarily an indication that the drug should be discontinued.

VIII. The Treatment of Cases of Poisoning.

Cases of poisoning constitute medical emergencies of the most urgent description, in which, therefore, a nurse must be prepared to act at once, otherwise the poison may have done its work before treatment is commenced. It is clearly the duty of a nurse to do what she can to counteract the effects of any poison that may have been taken, pending the arrival of the physician, though she must leave to him the administration of powerful drugs, such as opium, atrophine, or strychnine.

Antidotes.—When called upon to treat a case of poisoning, we endeavour to administer at once what is called an antidote—that is to say, the particular drug or substance which will prevent any further action of the poison that has been taken. This it may do—

(*a*) By removing the poison from the stomach through the act of vomiting.

(*b*) By combining with the poison in the stomach, and so rendering it harmless. An alkali, such as magnesia, is the chemical antidote to a mineral acid such as hydrochloric acid.

(*c*) By neutralising its effects upon the system. In this case the antidote acts by producing on the system

an effect the opposite of that produced by the poison that has been taken. For example, belladonna produces delirium, whereas opium causes coma, consequently these drugs are physiological antidotes to one another.

The Administration of an Emetic.—In the majority of cases it is a safe plan to empty the stomach by emetic or stomach-pump as promptly as possible, and this should always be done when the nurse does not know the poison which has been taken. *Mustard-and-water* forms an emetic that is always at hand. For an adult, one tablespoonful of the former should be stirred up in a tumbler of water and at once administered, without waiting for the powder to dissolve. For a child, a dessert-spoonful of mustard would be sufficient. *Common salt*, two tablespoonfuls in a tumbler of water, is also very efficient. If vomiting does not speedily follow upon the swallowing of the emetic, the back of the throat should be tickled with a feather or the index-finger.

The stomach having been emptied, the patient should be put to bed and kept quiet until the doctor's arrival, hot bottles and warm blankets being used, if necessary, to counteract the effects of shock. Further stimulation, by means of brandy or strong coffee, may be required. In many cases it is better to administer them by the bowel, as the stomach may have been damaged by the poison, and is, moreover, likely to reject them if the emetic has not produced its full effect.

Classification of Poisons.—Poisons may be roughly divided into *narcotics*, *corrosives*, and *irritants*.

(*a*) **Narcotics** act upon the nervous system, and tend to produce a condition of insensibility.

Opium is the most typical member of this group, and also the most common in cases of poisoning. Opium is present in laudanum, paregoric, nepenthe, Battley's solution, chlorodyne, and Dover's powder; and morphine in heroin and dionin.

The patient falls into a heavy sleep, the pupils become

contracted until they are mere pin-points (a most valuable sign of opium-poisoning), the breathing is stertorous, and gradually becomes more and more shallow and infrequent, until finally the patient dies from paralysis of his respiratory system. *Treatment.*—If the patient is seen before he becomes unconscious, a strong emetic must at once be administered; otherwise his stomach must be washed out by the medical attendant when he arrives. After the emetic has acted, a pint of strong hot coffee should be given him to drink, or, if he is unconscious, it must be injected into the bowel. Smelling-salts should be held to the nostrils, care being taken that the patient does not inhale too strong a dose. Some liquor atropinæ sulphatis ought to be obtained from a chemist for the doctor's use, and also a hypodermic syringe. To stimulate the respiratory system and keep it working, flap the patient's face with a wet towel, endeavour by every means to keep him from falling asleep, and, as a last resource, when the breathing becomes shallow and irregular, do artificial respiration.

Alcohol.—Coma resulting from acute alcoholic poisoning requires much the same treatment as that which is caused by opium—stomach-washing, hot coffee by the bowel, ammonia (cautiously) by the nostrils, and the application of cold water to the face and head.

Belladonna and its active principle *atropine*, when taken in excessive quantity, produce delirium, convulsions, coma, and death, the pupils being widely dilated from the commencement of symptoms. In this respect it contrasts strongly with opium. These two drugs are physiological antidotes to one another—that is to say, each tends to counteract the poisonous effects produced by the other upon the system. *Treatment.*—Emetics, strong coffee, hot blankets and bottles, with cold affusions to the face and head. Have some solution of morphine and a syringe in readiness for the physician.

Chloral.—The special danger of chloral poisoning is its tendency to cause death from sudden failure of the heart. *Treatment.*—The same as for opium poisoning. Strychnine

is the antidote for chloral. A small quantity of liquor strychninæ should be at once procured from the nearest chemist.

Prussic Acid, if taken in sufficient quantity, is the most rapidly acting of all poisons, producing almost instant insensibility. The patient's breath has the characteristic odour of bitter almonds. *Treatment.*—If possible, administer an emetic. If insensible, administer stimulants by the rectum, apply ammonia to the nostrils, dash cold water over the face and chest, and, when respiration begins to fail, do artificial respiration.

Poisonous Gases, such as acetylene, carbonic acid, carbon monoxide, coal gas, marsh gas, and pit gas, give rise to giddiness, lividity of the face, dilated pupils, convulsions, coma, or asphyxia. *Treatment* consists of fresh air, artificial respiration, oxygen inhalation, ammonia to the nostrils, rectal salines, and cold douches to head and chest.

(*b*) **Corrosive Poisons,** when taken in sufficient strength, destroy the tissues of the body by burning. Owing to the very serious injury which the stomach at once sustains from the action of such a poison, *emetics are not indicated.* Our object is rather to give drugs which are chemical antidotes, and will at once combine with the poison in the stomach, and render it harmless by neutralising it. Demulcent drinks are given afterwards, to soothe the irritated and inflamed mucous membrane. All these poisons produce intense burning pain in the stomach and gullet, with a white appearance of the tongue and mucous membrane of the mouth.

Hydrochloric, Nitric, and Sulphuric Acids.—Give magnesia, chalk, whiting, or common washing-soda, stirred up in plenty of water. Magnesia is the most suitable, because it neutralises acids without effervescing. Afterwards give milk-and-egg, or thick gruel, which must not be hot or it will cause great pain.

Oxalic Acid, or salts of lemon, a not uncommon poison, does not produce such destruction of tissue as the three acids previously mentioned Hence, the stomach may

be emptied by means of an emetic. *Treatment.*—Emetic, followed by ½ oz. of chalk in ½ pint of water, or, if it is at hand, lime-water freely. If a chemist is handy, get ½ oz. of saccharated lime-water, and give it in half a tumbler of water.

Carbolic Acid and *Creosote* produce even less corrosion than oxalic acid. The interior of the mouth is whitened, and there is pain in the throat and abdomen. A large dose produces delirium, followed by profound insensibility. The pupils are contracted, and the breath has a characteristic odour. *Treatment.*—The whites of two eggs in half a pint of water, followed by an emetic. If it can be procured at once, give ½ oz. of sulphate of magnesium, or 1 oz. of sulphate of sodium, in 4 oz. of water. These salts combine with the acid in the system, and so render it harmless. Stimulants and warmth.

Caustic Potash, Caustic Soda, and Strong Ammonia.—These three substances are called caustic alkalies. Their action upon the mucous membrane of the stomach and gullet resembles that produced by the strong acids. This is especially true of ammonia. *Treatment.*—For the above reason, it is better to avoid the use of an emetic, and give, instead, a weak acid, such as 1 oz. of vinegar, or lemon-juice, in 3 oz. of water. By this treatment any alkali in the stomach is neutralised, and so prevented doing any further damage. Follow up the acid with milk or olive-oil. Use stimulants and warmth. A steam-kettle will be necessary if ammonia has produced dyspnœa by its irritating effect on the air-passages. This latter result sometimes follows upon the injudicious application of ammonia to the nostrils of an unconscious patient.

(*c*) **Irritant Poisons,** so called, act upon the stomach and intestinal canal, causing pain, vomiting, and purging.

Arsenic forms the principal constituent of weed-killers, fly-papers, green paint, and one form of rat-poison. *Treatment.*—Emetic, followed by a tablespoonful of dialysed iron in 2 oz. of water every hour for six hours, or a teaspoonful of the light carbonate of magnesium may be given.

Stimulants and warmth. Send to the nearest chemist for the dialysed iron while the emetic is being administered.

Perchloride of Mercury (Corrosive Sublimate) and Biniodide Tablets.—Give at once raw white of egg and water. The albumin in the former is a chemical antidote for perchloride of mercury, combining with it to form a harmless substance. *After the antidote has been swallowed,* administer an emetic, and when the stomach has been emptied, repeat the dose of albumin-water. Warmth and stimulants.

Phosphorus is the principal constituent of a rat-paste. Children sometimes poison themselves by sucking the heads of matches. The breath has a garlicky odour. *Treatment.*—Give 3 grains of copper sulphate, dissolved in water, every five minutes, until vomiting is induced or three doses have been administered. This salt not only acts as an emetic, but is also an antidote for phosphorus, combining with it to form a harmless salt. If the copper is not immediately procurable, give half a teaspoonful of oil of turpentine in a tumbler of milk, and follow it up with the emetic. Warmth and stimulants. Do not give olive-oil, as it will dissolve the phosphorus in the stomach, and so render its absorption easier.

Strychnine is sometimes used for killing rats. A poisonous dose of this drug causes severe muscular spasms and convulsions, which may finally cause death by exhaustion. *Treatment.*—Emetic at once, if possible. Should the nurse have any capsules of amyl nitrite with her, let her break one for the patient to inhale. Obtain from a chemist, for the physician's use, chloroform and 2 drachms of bromide of potassium. Avoid doing anything that may excite or disturb the patient, otherwise the violence of the spasms may be increased.

Food Poisoning.—The eating of *shellfish* is often followed by nettle-rash, which in some instances (*e.g.*, so-called mussel poisoning) may lead to marked swelling of the face. The consumption of poisonous *fungi* in mistake for mushrooms may be followed by serious symptoms, due to a poisonous alkaloid, muscarine. *Meat* or *fish* which

is undergoing putrefaction may cause symptoms of gastro-enteritis, especially in delicate or susceptible persons. Ptomaines, the animal alkaloids present in putrefying fish or meat, were formerly believed to be the cause of the poisoning which occasionally results from the eating of brawn, pork-pies, &c. Investigation has shown, however, that these outbreaks are really due to the presence in the meat of disease-producing microbes—*e.g.*, *Gaertner's bacillus*, or more rarely of the toxins of certain microbes—*e.g.*, *bacillus botulinus*. Botulism and toad-stool poisoning are especially serious, as paralytic symptoms often develop.

Treatment aims at the removal of the irritant food by emetics or lavage of the stomach, and purgatives. If collapse occurs, the patient will require stimulants and hot bottles. Should nervous symptoms occur in toad-stool poisoning, the medical attendant will probably inject atropine, which is the antidote to muscarine. If botulism, a very rare disease, is suspected, the appropriate antitoxin will be injected; supplies of this are now available at various centres.

Chronic Poisoning.—(1) *Alcohol* produces in confirmed drunkards gastritis, liver cirrhosis, gout, neuritis, delirium tremens, and Bright's disease, and makes them bad subjects for severe illness. (2) *Lead* poisoning is common among lead-workers, probably from inhalation of dust. It may result from contamination of food and water, especially from the action of peaty water on leaden pipes (p. 25). It causes constipation, colic, anæmia, gout, neuritis (wrist-drop), and kidney disease, and produces a blue line on the gums. (3) *Morphine*, self-administered subcutaneously, causes loss of sense of right and wrong, lying, neglect of work, digestive troubles, and muscular weakness. The drug should be reduced gradually, lest collapse and delirium occur; the patient requires close watching. (4) *Cocaine* produces a pleasant and stimulating effect, and is a dangerous drug to administer, for it readily produces a habit. and mania may occur.

Homicidal Poisoning.—Very occasionally in medical

practice some incident happens which leads to the suspicion that a patient is the victim of foul play by the addition of poisonous substances to food or medicine. Many suspicions of this nature turn out to be unjustified. Homicidal poisoning is rare in this country ; detected cases are twice as many in the country as in the town, and more females use poisons than males.

Dr C. R. Lynch, Analyst to the Home Office, advised ('The Lancet,' 1927) that when poisoning was suspected the physician should attempt to take apparently motiveless steps to circumvent operations by alteration of diet or the time of day at which food was given in order to make things difficult for the suspected person. He suggested that a nurse should be engaged and given strict orders to prepare food ; that visitation of the patient by a suspected person should be forbidden for ordinary medical reasons, or only allowed in the presence of the nurse ; that careful notes of everything that happened should be made at the time and kept for reference ; and that specimens of excreta likely to contain poison should be saved and examined, especially those passed within twenty-four hours of the time when the poison was suspected of being given. Further than this it was impossible to go, unless suspicions were supported by fact. A communication to the police would at once start an elaborate investigation, and probably publicity would ensue, which, unless the suspicions were correct, would at least inflict great hardship on innocent individuals, and at worst would lead to an action for damages. In cases of doubt, if the patient were confined to his bed through illness, the doctor might with advantage urge his removal to a nursing home or hospital.

From this the nurse will gather how careful she should be in making a charge, and what her attitude should be towards patient and relatives. She should be slow to suspect, but when definite suspicions have arisen she should make careful notes, and communicate with the medical attendant on the subject, and with him only, letting him take the responsibility of further action. She should then await his instructions on the points mentioned above.

CHAPTER XI.

OBSERVATION OF THE PATIENT.

"The most important practical lesson that can be given to nurses is to teach them what to observe, how to observe; what symptoms indicate improvement, what the reverse; which are of importance, which are of none." Further, a nurse must know how to report correctly and concisely what she has observed; otherwise, she will afflict the doctor with a wearisome redundancy of detail, in which the most important points in the case are either slurred over or left out.

When making a report a nurse should always strive to be exact and give *facts*. She should never talk vaguely about the patient "having slept badly," or "not taken so well," but should be able to say how many hours' sleep, or how many ounces of food, he has had Again, she must strictly confine herself to those facts, and never, unless asked to, give her opinion on the case. A nurse who volunteers suggestions as to treatment or diagnosis does not know her place, and hence lays herself open to rebuke. A clear and brief reply in answer to each question is all that the doctor wants. The following are points to which a nurse should direct her attention, both when she first sees her patient and while he remains in her charge.

Appearance of the Patient.—Does the patient look ill or in pain? Has he the heavy listless expression of enteric fever, or the wide-awake anxious look of pneumonia and pericarditis? Has he the shrunken, hollow-eyed, anxious

face which accompanies acute peritonitis? Is he pale or flushed?—sudden pallor coming on in a case of enteric fever or gastric ulcer is usually due to severe internal hæmorrhage. Is there a bluish tinge about the lips, cheeks, and edges of the ears, due to imperfect oxygenation of the blood, the result of either heart or lung disease? Does the patient look well or ill-nourished? Does he look older or younger than he says he is? Is there any obvious deformity or weakness of any part of the body?

Position in Bed often gives most useful information. A patient naturally lies in the position which gives him most ease. If he has peritonitis, he will lie quite still on his back, with the knees drawn up to relax the abdominal muscles, and so take off all pressure from the inflamed and tender parts within. Colic, on the other hand, while it makes him draw up his legs, tends to produce restlessness, and, contrary to peritonitis, is relieved by pressure, so that the patient forces his hands into his abdomen, or even lies on his face. Difficulty of breathing, whether due to heart or lungs, makes him want to sit up. If he has pneumonia or pleurisy on one side of the chest, he will lie on that side, as by doing so he lessens its movement and thus diminishes pain, while at the same time he gives the unaffected lung a better chance of working. A patient with heart disease often prefers to lie on his right side, as this takes the weight of the liver off the heart. In the advanced stages of enteric fever he lies helplessly on his back, never moving of his own accord. When, after lying in such a position, he first begins to move on to his side, we may be sure that improvement has set in. If there is irritation of the brain from injury or disease, the patient lies curled up in bed and resents being disturbed. In meningitis there is often marked rigidity of the neck with bending backwards of the head. Extreme restlessness, coupled with sighing, is a symptom of severe hæmorrhage, or of heart failure such as is seen in the final stage of bad diphtheria.

Pain.—A nurse should always most carefully inquire into the character, locality, and duration of any pain of

which the patient may complain. In endeavouring to estimate the severity of the pain, she must be on her guard against exaggeration by the patient, for to some people any pain is a bad pain. If there is really much suffering, the patient's face will show it, while the frequency of the pulse-beats will be increased. If the pain is very severe, the patient may lie still, being afraid to move. Severe pain in the præcordial region, spreading thence down both arms, indicates a most dangerous form of heart disease, which may straightway prove fatal unless relieved. Acute abdominal pain and tenderness, arising in the course of enteric fever, is in the great majority of cases due to that very fatal complication, perforation of the intestine. Both of these are cases in which the doctor should be sent for at once. In neither is the patient restless: he remains quite still, with anxious face, hardly daring to breathe.

When describing a pain to the doctor, a nurse should always endeavour to quote the patient's words.

The Skin.—The points to notice about the skin are scars, ulcers, abrasions, bruises, or discoloration; any swelling, œdema, or jaundice; the comparative moisture or dryness of the skin, and its temperature. Anything like profuse perspiration occurring during the course of the illness should always be recorded, as it is sometimes a symptom of weakness, or it may be an indication that pus is forming in some part of the body. Marked pallor may be due to recent hæmorrhage, while blueness of the lips or beneath the finger-nails is an indication of imperfect aeration of the blood from heart disease or obstruction to the entrance of air into the lungs.

Any scaly patches on a child's scalp should be reported, as they may be due to *ringworm*. After examining one head, the nurse should always carefully wash her hands before touching another.

The Eyes.—Any irregularity in the size of the pupils, or tendency to squint, should be carefully taken note of, as it may point to grave complications, especially in a case where there is any suspicion of meningitis. In some cases

of cerebral hæmorrhage and in opium poisoning there is marked contraction of the pupils, which are then called "pin-point" pupils. In aneurism of the aorta they are sometimes unequal in size. In the very serious condition called "coma vigil" the patient lies unconscious with the eyes widely open. In cases of extreme exhaustion the eyes are sometimes incompletely closed during sleep, and hence are liable to irritation from dust or flies.

The Ears.—Pain in the ear, or discharge from that organ, should always be looked for in cases of diphtheria, measles, and scarlet fever, where the throat is inflamed. When the ear is discharging, any swelling or tenderness of the bone immediately behind it should be taken note of, as it is evidence of commencing inflammation in the bone, which, if not promptly and efficiently treated, may lead to serious complications. Singing in the ears and deafness, following upon the administration of quinine or salicylate of soda, should always be reported. A varying degree of deafness is usually present in enteric fever. In all cases where there is a possibility of head injury, the nurse should watch for the escape of blood or clear fluid (cerebro-spinal) from the ears.

The Alimentary System.—

The Mouth.—The presence of "sordes" upon the lips, teeth, and tongue should be noted. Sponginess of the gums, and any tenderness or looseness of the teeth, should be carefully watched for when the patient is taking mercury, as they point strongly to the necessity of stopping the drug. Excessive secretion of saliva also goes to show that the patient is fully under its influence. Ulceration of the gums is an occasional complication of scarlet fever.

The Tongue.—The nurse should notice, when a patient puts out his tongue, whether it is protruded in a straight line; if not, to which side it is inclined; also, whether it is tremulous. She should also note whether it is clean or furred, dry or moist, and whether any ulcers are present on it. The dry furred tongue is most often seen in enteric fever; but it may also be produced by sleeping with the

mouth open, the tongue being dried by the air continually passing over it. About the end of the fourth day of scarlet fever we get what is called the "strawberry" tongue, which is produced by a peeling of the tongue. That organ is then left red and raw, with large prominent papillæ, which resemble somewhat the seeds of a ripe strawberry.

Stomach.—Careful note should be taken of the patient's appetite, and of the exact amount of food he consumes in the twenty-four hours. Any difficulty in swallowing, or symptoms of indigestion such as flatulence, tightness of the chest, pain at the pit of the stomach or between the shoulders, or nausea after eating, should be reported, together with their exact relation to food. If the patient vomits, the quantity brought up should be measured, so that a true estimate may be formed of the amount of food thus lost. Special points to be noticed in connection with vomiting are its relation in point of time to the ingestion of food, whether preceded or accompanied by retching, pain, or flatulence, and the appearance of the vomit. The first vomit should be covered over and kept for the doctor's inspection, as should also any subsequent matters that are rejected, if they seem to the nurse unusual in appearance. Vomited blood may have come from the throat after the removal of the tonsils, or from the nose as the result of epistaxis; or it may have come from the stomach, being due to the bursting of a blood-vessel within that organ, as the result of chronic liver disease in a drunkard, or to the eating through of an artery by a gastric ulcer. In this latter case it is imperative that the stomach be kept empty. When blood has been retained for some time in the cavity of the stomach, it becomes partially digested, and then resembles coffee-grounds in appearance.

Intestines.—Marked abdominal distension, especially when occurring in enteric fever or suspected intestinal obstruction, is a grave and important symptom. Careful note should be made of any pain in the abdomen, its character and duration, together with its effect upon the general condition of the patient.

Stools.—The points to be noticed are their shape, colour consistency, and amount; whether they contain blood, mucus, pus, or undigested food; the frequency of the motions, and whether there is any pain in passing them. Anything unusual should be preserved and shown to the physician. This should always be done with the first stool of an enteric fever patient. In private work the nurse should procure a pane of glass with which to cover the bed-pan before showing its contents to the medical attendant. Blood in the stools may be the result of piles, or of ulceration in some part of the large or small intestine. A "tarry" stool is one which contains blood that has been acted upon by the gastric juice. That blood has therefore been in the stomach, or has come from the uppermost part of the small intestine. Iron and bismuth, when taken internally, blacken the stools. Clay-coloured motions are passed when, owing to some obstruction, bile is unable to get from the liver into the intestine.

Circulatory System.—A nurse should note any complaint of palpitation or of pain in the region of the heart. The former is frequently a symptom of no importance, being readily caused by anæmia, excitement, dyspepsia, and hysteria. The latter, if associated with heart disease, is of very grave import. Any tendency to faintness should be noticed. Like palpitation, it is much more common in people with healthy hearts than with diseased. It should, however, always be reported, as it may indicate a dangerous degree of prostration. Pulsating tumours should be noticed, and any swelling of the feet from dropsy.

The pulse was described in Chapter V.

Respiratory System.—The points to be observed are the frequency of the respirations, whether they are noisy or quiet, shallow or deep, difficult or easy, regular or irregular in time and force. Irregular respiration is one of the first symptoms of tuberculous meningitis, and therefore of much importance when the presence of that disease is suspected.

Abnormalities of respiration were dealt with in Chapter V.

Cough.—The points which a nurse should notice about a cough are its frequency, duration, whether it exhausts the patient, whether it is more marked during one period of the twenty-four hours than another, and its character. This latter feature varies very much in different diseases.

In pneumonia and pleurisy the cough is short and restrained, because it hurts the patient to cough ; in laryngeal obstruction it may be hoarse, or loud and ringing ; in hysteria it is barking ; in whooping-cough a series of rapid short coughs is followed in most cases by the whoop, though this is not always present ; in early phthisis we hear a slight hacking cough. A cough is characterised as " tight " or " loose " according to the absence or presence of expectoration.

Expectoration varies in character in different diseases, and also at different times in the same disease. If there is lung disease of an acute nature, a specimen of expectoration should be kept each day for the physician, and, if it seems to be excessive, the quantity in each twenty-four hours should be measured. Its appearance should be carefully observed by the nurse. In acute bronchitis it is at first white, frothy, and stringy ; later on it becomes yellow and opaque. In acute pneumonia it is very tenacious and of a rusty or plum colour, owing to the presence of blood-colouring matter in it. If there is gangrene of the lung, the sputum is abundant, purulent, and very offensive. In phthisis it is purulent, and often takes the shape of small, flat, round masses like coins, and hence is called " nummular." Children, as a rule, do not expectorate, but swallow the sputum. This the nurse should endeavour to prevent. Miners' sputum is usually of a black colour from the coal dust which has been inhaled.

Hæmoptysis, or the spitting of blood, when occurring in any quantity, is almost always due to phthisis. In this disease the lung is gradually eaten away into cavities. During this process an artery may be opened before it is plugged with clot, and commences to bleed. The blood gets into the trachea and is coughed up.

Nervous System.—Under this heading come several points to which a nurse should pay careful attention.

Convulsions.—A nurse should always endeavour to find out whether convulsions begin in one part—*e.g.*, the side of the face or the hand—and spread from thence to the rest of the body. The duration and severity of the attack should also be taken note of. They are liable to occur in brain and kidney disease, epilepsy, and at the moment of death in almost any ailment.

Coma is a condition of complete unconsciousness. Should it attack a patient while under the nurse's observation, she should note whether the onset is sudden or gradual, and if the latter, the length of time that elapses before complete unconsciousness supervenes.

Delirium.—Is it of the low muttering type, as in advanced enteric, or active and noisy, as in the early stage of acute pneumonia? Is it more pronounced at one part of the twenty-four hours than another?

Paralysis.—A nurse should note at once the exact degree and extent of the paralysis, so that she may be able to report any subsequent increase or decrease to the medical attendant. If it comes on while she has the patient under observation, she should note the manner of onset—*i.e.*, whether the paralysis is suddenly or gradually established. Also she should notice whether it varies at any time in the twenty-four hours—*e.g.*, whether a patient who could not move the legs at all when the doctor was present in the morning draws them up slightly in the afternoon.

Loss of Speech.—Is there absolute loss of speech? is speech limited to "yes" and "no"? or has the patient a limited command of speech, but uses the wrong words? Any of these conditions may accompany paralysis of the right half of the body.

Sleeplessness may be caused by a variety of conditions, among the most important of which is distension of the stomach with wind, giving rise to a feeling of oppression and pain in the cardiac region. A drink of hot water often brings relief by assisting in the escape of gas. A

nurse should take care that it is not due to cold feet, too few or too many bedclothes, the want of a warm drink, or to a light shining in the patient's face. It may also be due to pain or mental worry, both of which the nurse should do her best to relieve. A nurse should always note the exact number of hours that her patient sleeps, whether his rest is disturbed by dreams, and whether his mind wanders.

Tremor of the hands and tongue, apart from disease of the nervous system, is a symptom of prostration, and is common in the later stages of enteric fever.

Rigor is an important symptom of which the nurse should take careful note and never fail to report. Rigors vary much in intensity and duration. There may be only a slight attack of shivering which quickly passes away, or most severe and general shaking, with chattering of the teeth, lasting for several minutes. While the patient is in a rigor the face and tips of the fingers are blue, the pulse small and hard, and the expression one of great discomfort. The temperature is raised, and the patient may vomit. Rigors are very important, since they may either mark the commencement of an illness such as acute pneumonia, or they may be the first indication of a serious complication, such as perforation of the intestine in enteric fever. A nurse should note the duration and severity of the rigor, the condition of the patient while in it, and his temperature both during and after the attack.

Genito-Urinary System.—In female patients a nurse should make herself acquainted with the regularity or irregularity of the menstrual function, and the presence or absence of any discharge. If the patient is pregnant, the fact should be reported.

Any pain or difficulty in passing urine, suppression, or incontinence, must be noted.

CHAPTER XII.

FIRST-AID IN EMERGENCIES.

1. **Hæmorrhage.**—(*a*) *Epistaxis*, or nose-bleeding, may be treated by raising the arms, applying some cold article to the back of the neck, or putting an ice-bag on the nose. If these fail, the cavity of the nose may require packing with strips of gauze.

(*b*) *After Extraction of a Tooth.*—The tooth socket should be emptied of clot, and plugged with gauze. A pad of folded lint should then be placed over the socket, and the patient should clench his jaws and so exert firm pressure on it.

(*c*) *Hæmoptysis.*—The patient should lie quietly in the recumbent position. Ice may be sucked to allay the cough. A hypodermic injection of morphine is often given by the medical attendant. Inhalation of amyl nitrite 3-5 min. is sometimes used.

(*d*) *Hæmatemesis.*—Rest in the recumbent position, an ice-bag to the epigastrium, a hypodermic injection of morphine, and abstention from food by mouth, form the usual treatment.

(*e*) *From an Artery.*—The blood is bright scarlet, and comes in spurts. Pressure should be applied to the spot if this is possible. If impossible, owing to the depth of the wound or to it being enveloped in dressings, pressure should be applied on the main artery higher up (see p. 486). A tourniquet should not be applied except in case of absolute necessity; one may be improvised from a bandage or a

handkerchief, a short stick or poker being used to twist it after knotting.

(*f*) *From a ruptured Varicose Vein.*—The blood is dark bluish-red, and flows in a steady stream. The patient should lie down, the limb should be raised, and any constricting band, *e.g.*, a garter, removed. Pressure should be applied with the finger, until a pad and bandage are obtained. No tourniquet should ever be used.

(*g*) *From Capillaries.*—The blood is red, and wells up from all parts of the wound. It can be arrested by applying firm pressure on the bleeding spot by pad and bandage. If necessary, the pad may be soaked in adrenalin (1 in 1000).

(*h*) *Scalp Wounds.*—Bring the edges of the wound together, apply a pad and dressing, and bandage firmly over the skull. The surgeon will clean the wound, and shave the surrounding part.

(*i*) *Cuts.*—Cuts should be thoroughly washed, and painted with iodine; the edges should be brought together, and a dressing of gauze, wool, and bandage applied.

(*j*) *Bruises* should be treated by putting on them a single layer of linen, moistened with cold water or evaporating lotion.

2. **Fits.**—(*a*) *Hysteria.* Hysterical fits are often accompanied by unconsciousness and irregular convulsive movements. The patient resists attempts to raise the upper eyelid, and turns the eye away. Onlookers should be dismissed and the patient left alone, or cold water may be suddenly dashed in her face.

(*b*) *Epilepsy.*—The patient becomes unconscious and rigid; convulsions then occur, followed later by a deep sleep. The tongue may be bitten, and urine passed. Let the patient lie; loosen all constrictions about his neck; if possible, place a piece of wood between the teeth to prevent the tongue being bitten; and then leave him alone. Death during a fit is usually due to drowning, falling in a fire, or suffocation during sleep.

(*c*) *Infantile Convulsions.*—Put the child into a hot bath, apply cold water to the head, and give a dose of castor-oil.

(*d*) *Apoplexy.*—The patient is unconscious, the face flushed, and the breathing snoring, and one or more limbs may be paralysed. Raise the head a little, keep the patient quiet, and send for the doctor. No stimulant should be given.

3. **Fainting.**—This is caused by a sudden and temporary weakening of the heart's action. The face is pale, there is frequently a cold sweat, and the pulse is absent or very feeble. Let the patient lie down, or sit bending down with his head between his knees. Give stimulants, and get him in the open as soon as he has recovered somewhat.

4. **Asphyxia** may be due to (*a*) *Obstruction of the air-passages* by foreign bodies (choking), blood-clot, vomit, diphtheritic membrane, &c.; by swelling of the lining membrane of the larynx, following the inhalation of steam; by pressure from without, as by strangulation, pressure of tumours; or by drowning.

(*b*) *Inhalation of irrespirable gases*, such as smoke, coal gas, carbonic acid gas, sewer gas, &c.

(*c*) *Overdose of chloroform*, acting on the respiratory centre.

The treatment consists in removing the cause, or withdrawing the patient from its action. If no cause is obvious, open the mouth with a gag and explore the back of the throat with the finger. Then loosen any clothing constricting neck or chest, pull the tongue forward, and apply artificial respiration.

If it is a case of *drowning*, clean out the throat with a portion of handkerchief wrapped round the finger; place the patient face downwards, the abdomen resting on a folded coat or the operator's knee, so that the trunk is higher than the mouth; and press firmly on the sides of the chest, so as to expel from the bronchi any water that may have entered them. Then turn him on his back, and adopt artificial respiration.

Schafer's Method.—The patient is placed on his face, with the head turned to one side. The operator kneels astride

or beside him, and compresses the lower ribs, expelling air and water from the chest. The pressure on the ribs is released, and repeated eighteen times a minute.

Sylvester's Method.—If an assistant is at hand, he should grasp the tip of the tongue firmly with a handkerchief, and drag it well forwards. A folded coat or small pillow is placed under the upper part of the back, so as to raise the chest slightly. The patient's arms are now grasped just above the elbows (a nurse would probably have to grasp the wrists of a man) and pressed firmly against his sides, thus expelling some air from the lungs. They are next slowly drawn outwards, and raised upwards, until they meet above his head. This opens the chest, and allows air to enter it. After keeping them raised for two seconds, they are slowly lowered and pressed forcibly against the ribs. After waiting two seconds, they are again raised and the movements repeated. It is important that artificial respiration should not be done too quickly. The arms should be raised and lowered about twelve times per minute. While they are being drawn firmly and steadily upwards, they should be kept rotated outwards so as to drag on the ribs, and pressed tightly against the sides of the chest when they are lowered.

While artificial respiration is being done assistants should take off the wet clothing, rub the skin with hot towels, and wrap the body in hot blankets. Stimulants should be given, and the patient put to bed.

Choking.—Open the mouth, pass the forefinger to the back of the throat, and attempt to hook up the foreign body (meat, false teeth, &c.). Several attempts may be necessary, in the intervals of which the patient may be thumped on the back while the head is well bent forward. Artificial respiration may be required afterwards.

5. **Shock** is apt to follow injuries and operations of a severe nature. Treatment is by rest, warmth in moderation, and hot fluids by mouth. In severe cases the foot of the bed should be raised, and the limbs and abdomen

compressed by bandages to assist in raising the blood pressure. The medical attendant will probably give morphine, inject saline or gum solution, or perform blood transfusion.

6. **Burns and Scalds.**—Treat any shock, exclude air from the burnt part, and apply dressings. If there is shock, warm stimulants should be given, and the patient kept warm. The clothes must not be pulled off, but cut off with knife or scissors. The limb should be covered immediately, either by immersing it in warm water, or, if this is not available, by applying linen soaked in an oily substance (Carron oil, linseed oil, vaseline, boric ointment), and covering with wool and a light bandage.

7. **Fractures, Dislocations, and Sprains.**—See Chapter XXXII.

8. **Poisons.**—See p. 212.

9. **Foreign Bodies.**—(*a*) *In the Eye.* If the foreign body is a grain of dust, draw the eyelid forward by means of the lashes, and the tears will often wash it away. If it can be seen, remove it with a corner of a clean handkerchief. If it is under the upper lid, it may be necessary to turn the lid inside out by rolling it over a thin penholder laid on it.

When *quicklime, acid,* or other *caustic* material injures the eye, the patient should at once drop the face into a basin of water to which some bicarbonate of soda has been added, and open and shut the eyelids frequently. Afterwards a drop of castor-oil should be inserted.

(*b*) *In the Ear.*—If it is an insect, pour some warmed olive-oil into the passage with the patient lying down. If anything else, unless the end projects, it should on no account be touched, but should be left for the doctor.

(*c*) *In the Nose.*—A shirt button, bead, orange-pip, &c., can often be got rid of by causing sneezing, for which purpose a pinch of snuff or mustard and pepper may be given. If this does not act, the case should be referred to the doctor.

(*d*) *In the Throat.*—See "Choking," p. 203.

(*e*) *In the Digestive Tract.*—Buttons, pins, and small toys frequently find their way into the stomach through children placing such objects in their mouths. Coins larger than a halfpenny will not pass through the pylorus, and it is necessary to incise the stomach wall to remove them. Pins generally pass through the pylorus, but sometimes are arrested in the duodenum, which they may perforate. First aid, when any sharp-pointed article is swallowed, consists in giving a meal of thick porridge, and taking the child to a hospital to be X-rayed and dealt with by a surgeon.

(*f*) *In Trachea.*—If the child is suffocating, hold him up by the legs with the head hanging down. Otherwise, keep him quiet until the doctor arrives.

10. **False Croup** occurs in children at night. Let the child inhale steam from a jug of boiling water. Give a hot bath containing a little mustard; dry and wrap in a hot blanket, and apply hot sponges frequently to the throat.

11. **Stings** of bees and wasps should be treated by removing the sting, and wiping freely with spirit, or applying a blue bag or a strong solution of washing soda. Stimulants may be necessary.

12. **Injuries to Soft Parts.**—(*a*) A *contusion* is treated by cold water or evaporating lotion, or by a firm bandage, to limit the hæmatoma. (*b*) An *abrasion* is washed with water (preferably boiled), and vaseline or boric ointment applied on a clean strip of linen. (*c*) In *wounds*, hæmorrhage should be arrested by pressure or by tying a clean handkerchief over the wound; if bleeding is profuse, a tourniquet should be used. The wound is covered with clean linen and a bandage until the surgeon can deal with it.

13. **Dog Bites.**—Wash the wound; squeeze the blood towards the bite, and let the patient suck it and spit out the blood. If a finger is involved, string may be tied round its root while this is being done. Cauterising with pure carbolic should follow.

14. **Frost Bite.**—Rub the affected part until there is

evidence that the circulation is restored. Do not apply heat.

15. **Brain Injury.**—(*a*) *Concussion,* or stunning, varies with the severity of the injury from giddiness and confusion of thought to complete insensibility. In the latter case the eyelids are closed, the pupils vary in size and usually react to light, respirations are slow and sighing, pulse weak, and temperature subnormal. Improvement is followed by increased rate of pulse and respiration and a gradual return of consciousness, often with vomiting. In other cases the patient may die of *shock,* or he may develop *cerebral irritation* (closed eyelids, headache, irritability, with often permanent mental change) or *compression* from intracranial bleeding. The patient should be put to bed with the head low, and covered with warm blankets. Hot-water bottles and friction may be applied to the limbs, but care should be taken not to over-stimulate. Afterwards, calomel should be given. He should stay in bed at least a fortnight. In severe cases the head should be shaved and an ice-bag applied, the bedroom being kept dark and quiet and no talking being allowed. Iced milk, chicken broth, or beef-tea may be given by spoon if he can take it thus, or nutrient enemata may be used.

(*b*) *Compression* may be due to depressed bone, a foreign body, intracranial hæmorrhage, or acute œdema of brain. The patient cannot be roused, breathing is slow with stertor and puffing of cheeks, pulse slow and full, pupils dilated and not reacting to light. First aid consists in keeping the head on one side or pulling the tongue forwards, to avoid any interference with breathing from falling back of the tongue. On arrival in hospital, immediate operation is done if there is depressed bone, foreign body, or hæmorrhage from the middle meningeal artery. Otherwise treatment resolves itself into keeping the patient quiet, with the head low and cool, the room dark and noiseless, the bowels open (croton oil on sugar is often given), and the bladder empty. Nutrient enemata are given, and venesection may be required if there is much cyanosis.

(*c*) *Fracture.*—See p. 567.

16. **Gas Poisoning** may be due to escape of gas, mine explosion, or fumes in a sewer. The sufferer is taken to the open air, clothing is loosened, and the face is smacked with a wet towel. If this fails, artificial respiration should be adopted at once, and preparations made for blood transfusion.

17. **Acute Alcohol Poisoning.**—The patient is unconscious, pale, cold, with dilated pupils and slow heavy breathing. He may generally be aroused with difficulty. The stomach is emptied and washed out, and a cup of strong hot coffee given; hot blankets and bottles are applied.

18. **Hiccough** is due to a spasmodic contraction of the diaphragm, causing an abrupt inspiration which is cut short by a sudden closure of the glottis. The *cause* may be below the diaphragm (*e.g.*, overloading of the stomach, hepatic abscess or new growth, or peritonitis), or above it (*e.g.*, diaphragmatic pleurisy, or empyema); or it may be cerebral irritation (as in uraemia, typhoid fever, cerebral hæmorrhage, or tumour), influenza, or hysteria. *Treatment.*—The patient may try holding his breath, gargling with water, tickling the nose and sneezing, holding his arms above his head, flexing his thighs on the abdomen, pressing firmly on the epigastrium, or eating a lump of sugar. If these fail, pressure on the supraorbital nerves, or traction on the tongue, or a mustard plaster to the epigastrium, may be tried. In gastric cases, a teaspoonful of sal volatile in a little hot water, or wash out the stomach, may be useful. Persistent cases may require atropine or morphine hypodermically, sedatives, amyl nitrite inhalation, or an emetic.

PART III.
BACTERIOLOGY.

CHAPTER XIII.

BACTERIA AND PROTOZOA.

A MICROBE, known also as a micro-organism or a germ, is an extremely minute form of life, consisting of a single cell, which if vegetable is called a *bacterium*, or if animal a *protozoon*. Bacteria are present everywhere—in earth, air, and water,—and each one of us carries countless thousands on the skin, as well as in the nose, throat, and intestines. Protozoa are found in moist soil, in sea-water, and in stagnant pools.

A. BACTERIA.

General.—A microbe which is capable of damaging the health of animals or plants is called **pathogenic**, but very many bacteria do no harm, and may on the contrary be useful. Thus bacteria may conveniently be divided as regards their action into three groups :—

(1) The numerous group which obtains its nourishment from dead animal and vegetable matters, breaking them up by fermentation and putrefaction (offensive decomposition). These are known as *saprophytic* bacteria, and they create from the dead material those compounds of carbon and nitrogen

which are essential for vegetable growth. Animals in their turn subsist on this vegetation, and thus these microbes are indirectly requisite for animal life.

(2) Those other bacteria, comparatively few in number, which are harmful, for they can multiply only in living structures. They are called *parasitic*. We may cite as examples the bacilli which give rise to diphtheria and tuberculosis.

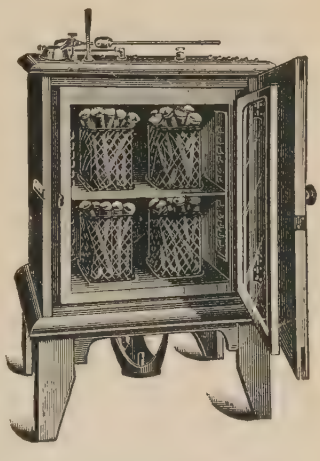
(3) Those microbes which are *both saprophytic and parasitic*. They can exist outside the body on dead material, but if they gain entrance to the blood or tissues they damage the living body. Such are the bacteria of sepsis, which, since they can live on dead material, are found on everything which has not been sterilised. This is the reason why the slightest breach of the technique of asepsis leads to disaster in connection with wounds.

A microbe multiplies with the most extraordinary rapidity. It is able by division to give rise to many thousands of its kind in the course of a few hours. It must be living under favourable conditions to do this ; especially it must be supplied with food, heat, and moisture, all of which conditions are found in the human body. When the surroundings are not suitable, some varieties of bacilli become converted into oval bodies, called *spores*, which form what is called a " resting stage," and which are very difficult to kill. If placed in an incubator which can be kept at blood-heat, many germs may be grown artificially—*e.g.*, in broth, or on a slope of agar, gelatine, or coagulated blood-serum [1] contained in a culture-tube.

Classification.—So small are bacteria that when magni-

[1] The blood-serum culture-tube, which is generally used in taking a culture from the throat, should always be kept upright, otherwise the few drops of moisture present will be absorbed by the cotton-wool stopper and the growth of bacteria will be thereby impaired. The swab-tube, when used, should be so marked that there will be no risk of its being used again ; thus the wire may be bent, the swab or stopper charred in a flame, or the tube labelled.

fied by the microscope many hundreds of times they appear only as small dots, known as *cocci*, or as very minute rods, which are called *bacilli* if straight, or *spirilla* if spiral. There are still other microbes, so small that they cannot be seen even with the most powerful microscope, and these are known as *ultra-microscopic organisms*.



Hearson's Bacteriological Incubator.

(1) **Cocci.**—Erysipelas, cellulitis, and puerperal septicæmia are due to *streptococci*—that is, to cocci which are arranged in chains. Streptococci are also found in many cases of pyæmia.

Acute abscesses, acute suppurative osteomyelitis, boils, and some cases of pyæmia, are associated with *staphylococci*, which are cocci arranged in grape-like clusters. Staphylococci are found abundantly in the superficial layers of the skin and frequently beneath the finger nails; hence the need for careful preparation of the hands before touching any wound.

Gonorrhœa is due to the *gonococcus*, cerebro-spinal meningitis to the *meningococcus*, and pneumonia to the *pneumococcus*.

(2) **Bacilli.**—The diseases diphtheria, plague, typhoid fever, tuberculosis, and tetanus (lock-jaw) are all due to special bacilli. In some cases suppuration also is due to bacilli, such as Bacillus coli communis (in suppurative peritonitis), and Bacillus pyocyaneus (which produces blue or green pus). "Cold ab-

scesses" are due to Bacillus tuberculosis; they are not septic, and must not be allowed to become infected with septic bacteria.

(3) **Spirilla.**—Cholera, for example, is due to a special spirillum.

(4) **Ultra-microscopic Organisms.**—In certain diseases, such as measles, mumps, smallpox, hydrophobia, typhus, and yellow fever, no specific microbe has been identified. Serum or other fluid, however, taken from a case of certain of these diseases and passed through a filter, is found to be capable of giving rise to the disease, notwithstanding that the filter is so fine as to arrest the smallest bacteria known. It is, therefore, assumed that these diseases are due to microbes too small to be seen by the microscope; hence the name which has been applied to them.

Mode of Action.—Bacteria may be introduced into the body by (1) *contagion*, or contact, as in gonorrhœa; (2) *inhalation*, as in whooping cough and pulmonary tuberculosis; (3) *swallowing*, as in typhoid fever and abdominal tuberculosis; and (4) *inoculation*, as in plague (through a flea-bite), typhus (through a louse-bite), and tetanus or sepsis (through a wound). This subject is dealt with in greater detail in Chapter XXII. (p. 387).

Pathogenic organisms produce a poison. If diphtheria bacilli, for example, are grown in broth and are then completely removed by filtering, the broth will be found to contain a substance which, injected into men or guinea-pigs, is exceedingly poisonous. The poisons produced by bacteria are known as *toxins*. Toxins are absorbed into the circulation, and give rise to fever and the various symptoms of the disease.

Inoculation of Culture-Tubes.—A platinum loop, mounted in a handle and sterilised in the flame, is used in the case of pus, etc. A small piece of the material to be examined is taken on the wire and stroked on the medium in the culture-tube, the wire being flamed after-

wards. The material must touch nothing that is not sterile. Throat swabs are similarly applied.

B. Protozoa.

Of these there are many kinds, varying much in size and shape. Although the great majority are saprophytic, a considerable number are parasitic and cause certain diseases of animals and plants. Fortunately, however, only a few are pathogenic to man.

Among the latter the most important are the *spirochæte,* which causes syphilis; the *trypanosome,* which produces sleeping sickness; the *amœba,* which gives rise to one form of dysentery; and the *plasmodium,* which is the cause of malaria. The spirochæte enters the body through an abrasion, the trypanosome by the bite of a species of fly, the amœba by being swallowed, and the plasmodium by the bite of a particular kind of mosquito.

The **Spirochæte of Syphilis** is a fine thread, which is curled like a cork-screw and has the power of moving about in the blood. Although it can be found deep in the tissues in all stages of the disease, it is only in those stages which are infectious (the primary and secondary stages) that it has access to the surface of the body, the skin, and the mucous membranes. It is killed by certain drugs, such as mercury and salvarsan.

The **Plasmodium of Malaria** is a small body, shaped like a signet-ring, found in the red corpuscles of the blood of the infected patient. A mosquito bites a patient suffering from malaria, and takes into itself blood containing the parasite. In the body of the mosquito the parasite undergoes certain developmental changes. The infected mosquito then bites another person and passes on the parasite. In the human blood this undergoes further changes, and breaks up into small bodies which infect other blood corpuscles, this event being accompanied by rigors, sweatings, and pyrexia. These attacks of "fever" recur at regular intervals as each generation of parasites comes to maturity. The plasmodium is killed by quinine.

CHAPTER XIV.

IMMUNITY.

A PERSON is said to be immune to a disease when he can be intimately exposed to that disease and yet does not develop it. This property may be *natural* or it may be *acquired* either through a previous attack of the disease or by treatment with antitoxin or vaccine.

I. THEORY OF IMMUNITY.

Immunity has proved a fascinating study for the last generation, and a brief account of the current theory will be a useful introduction to an understanding of the practical uses that are made of immunity reactions, for example, by antitoxin and vaccine in treatment, and by the Widal and Wassermann reactions in the diagnosis of typhoid and syphilis respectively. Briefly, it may be said that immunity is believed to be secured by the action of *phagocytes* and *antibodies*.

For many years it has been known, as originally pointed out by Metchnikoff, that certain white corpuscles of the blood have the power of destroying bacteria by enveloping and digesting them, and to these corpuscles the name of **phagocytes** is given. It is found, however, that, if the bacteria enveloped prove too powerful, the phagocyte dies. Thus the pus cells, which give the creamy appearance to a purulent discharge, are phagocytes which have

been killed in their endeavour to protect the body from septic micro-organisms. Further, if the bacteria succeed in so far gaining the upper hand that they produce a sufficiently large quantity of toxin, the animal itself dies.

The body's first step in defence, when invaded by pathogenic bacteria, is usually, therefore, an increase in the number of leucocytes. This is called *leucocytosis*, and in some diseases the leucocytes are increased even to five times the normal number. But, as already said, the duty of defence does not devolve on the phagocytes alone. The cells of the tissues, also, take an essential part by secreting certain substances, collectively known as **antibodies.** Invasion by bacteria leads to a marked production of these substances, some of which are possibly present normally in minute quantities in a person's blood-serum.

The antibodies act in the defence in several different ways. One, *agglutinin*, causes the germs to stick together or "clump"; another, *bacteriolysin*, working in conjunction with a *complement*, shrinks or breaks up the bacteria; another, *opsonin*, aids the phagocytes by making the bacteria more readily ingested by them, more palatable as it is said; while another, *antitoxin*, neutralises the toxin produced.

II. Practical Uses.

Our knowledge is still very incomplete, but valuable practical use is made of that which we do possess.

(1) **In Diagnosis.**—(*a*) *Leucocytosis.* Usually a bacterial invasion which causes pyrexia produces leucocytosis, but there are two notable exceptions—viz., enteric fever and miliary tuberculosis. If, therefore, in any particular case the diagnosis lies between enteric fever and pneumonia, the absence of leucocytosis would point to the former.

(*b*) *Agglutinins.*—In typhoid and paratyphoid fevers and in cerebro-spinal meningitis, the blood-serum of the patient will clump emulsions of the bacteria causing the disease. This agglutination test, known in the case of typhoid as the

Widal reaction, often proves of great value in confirming the diagnosis.

(2) **In Prognosis.**—*Opsonins.* The prognosis of a patient and the success of a treatment may be estimated in some diseases by counting under the microscope the number of the infecting bacteria his phagocytes can ingest in a given time. This is known as the *opsonic index.*

(3) **In Treatment.**—(*a*) *Antitoxins.* Only in the case of a few bacteria, unfortunately, can an antitoxin be made capable of being used in treatment, the commonest being those of diphtheria and tetanus.

To make *diphtheria antitoxin* a horse is taken, and into its body gradually increasing doses of diphtheria toxin (prepared by growing bacilli in broth for some days and then filtering the broth) are injected for a period of several weeks. It is not seriously affected by this treatment, since it is usually not very susceptible to diphtheria. When its blood is sufficiently rich in antitoxin, some of it is withdrawn and allowed to clot. The clear part, or *serum,* which contains the antitoxin, is thus separated from the corpuscles, and placed in small air-tight bottles or tubes till wanted. The number of units of antitoxin in each bottle is indicated on the label.

Diphtheria antitoxin, as is well known, is used with success in the treatment of diphtheria, and the earlier it is given the greater its efficiency and the less the mortality. In injecting antitoxin prepared from the horse we are rapidly and copiously adding to the amount of antitoxin which is already in the patient's blood, and which his tissues are making for their own protection. Mild cases usually receive one dose of 4000 to 12,000 units ; moderate cases two doses of 12,000 units each, and severe ones doses of 18,000 to 24,000 units on two or three successive days.

Serum Sickness.—The subcutaneous injection of horse-serum often leads to certain symptoms on or about the eighth day after the first dose has been administered. The symptoms consist of an urticarial rash, blotchy or some-

times ringed, with itching which may be very troublesome, and usually a little later, mild pyrexia, pain in and swelling of the joints, and some malaise. The urticaria may be generalised, or it may be concentrated about the site of injection of the serum, in which case it often appears much earlier. Treatment is by lotions (saturated bicarbonate of soda or dilute carbolic acid, 1 in 100), or aspirin may be given internally. Not infrequently the rash takes the form of an erythema resembling that of scarlet fever.

Anaphylaxis.—After the lapse of ten days from the injection of a protein, such as is contained in horse-serum, a patient may become over-susceptible to another injection; and, if one is given, he may develop sudden illness, varying in severity from slight dyspnœa to sudden death. This condition of over-susceptibility is known as anaphylaxis.

(*b*) *Antibacterial sera,* produced by injecting an animal with dead bacteria, are used in certain diseases. They are often not successful, perhaps because the particular microbe (*e.g.*, streptococcus or meningococcus, of both of which there are many varieties) used in the manufacture may not be identical with the one affecting the actual patient. For this reason a *polyvalent serum* is often used; this is made by injecting the horse with dead bacteria obtained from several patients suffering from the disease.

(*c*) *Vaccines.*—See Active Immunity (p. 246).

III. Natural Immunity.

Natural immunity, which may be due to age or to inherited constitutional conditions, is increased by healthy hygienic surroundings, such as cleanliness, exposure to fresh air and sunlight, sufficient food, and properly regulated exercise and rest. Ill-feeding, alcoholism, and overwork, on the other hand, decrease it. Thus it is found that a combination of prolonged cold and wet with over-tiredness

and hunger will induce pneumonia in one who, in the absence of these conditions, has been carrying the pneumococcus in his respiratory passages without ill effect.

IV. Acquired Immunity.

There are two kinds of acquired immunity, *passive* and *active*.

A. **Passive Immunity** is that obtained by supplying a patient with antibodies from the blood-serum *of another animal*. Thus, in the prevention of diphtheria and tetanus we may use an *antitoxic serum*, produced by injecting an animal with toxin. The protection, however, persists only so long as the serum and its contents remain in the system; in the case of diphtheria antitoxin, only three or four weeks.

B. **Active Immunity** is obtained by stimulating the tissue-cells of the patient to produce *their own* antibodies, and is usually much more lasting. It occurs *naturally* as a result of a previous attack of the disease. It is well-known that one attack of a specific fever protects an individual against a second attack, the period during which this protection lasts varying with the different fevers. In smallpox and chickenpox it persists for a long time, whereas in diphtheria it is often of short duration.

It may be produced also *artificially* (1) by inoculation with living bacteria of greatly reduced virulence (against smallpox and hydrophobia only), or (2) by inoculation with dead bacteria (against typhoid fever, cholera, plague, colds, &c.)

(1) *Vaccination with bacteria of reduced virulence.*—There is a disease occurring on the udders of cows, *cowpox*, which is believed to be the form which smallpox takes when it affects the cow, the passage of the ultra-microscopic organisms through the cow reducing their virulence to this remarkable extent.

In 1796, it was observed by Jenner that people who had accidentally inoculated themselves with cowpox (*vaccinia*) when milking did not contract smallpox. Thus was started the practice of *vaccination*, the vaccine in the first instance being taken from the pocks on the udders of cows. Later it was collected from the arms of children, the vesicles caused by vaccination being opened and their contents collected while the fluid was still clear. At the present time, to avoid the risk of using vaccine from an unhealthy child, calves are inoculated and from them a supply of lymph is maintained. Every precaution is taken to ensure that it shall be pure: the place on the calf's abdomen is shaved and thoroughly cleaned, and before the vaccine which is subsequently obtained is used, the animal is killed and a careful examination of all its organs made. If there is the least doubt as to the health of the calf, the vaccine which has been obtained from it is destroyed.

The protective effect of vaccination does not last for ever; neither does that which follows an attack of smallpox. Revaccination should consequently be performed about every seven to ten years, according to the prevalence of smallpox. Although remote vaccination may fail to prevent an attack of smallpox, it almost invariably modifies it, so that a vaccinated person has a far better chance of recovering than one who is unvaccinated.

(2) *Vaccination with dead bacteria.*—Bacteria, taken from a patient suffering from a particular disease (typhoid, cholera, plague, catarrh, sepsis, &c.), are grown in an incubator and purified. They are then mixed with saline solution, and killed by heat; this emulsion constitutes the *vaccine.*

The bacteria in a minute quantity of the emulsion are counted, and from this count the quantity of fluid containing 5, 10, 20, &c., millions of bacteria is estimated. These quantities are put up in sealed small glass flasks, and serve as a dose for injection under the skin, the dosage being gradually increased. The best results are usually obtained

by employing an *autogenous vaccine*—that is, one prepared from the special organism obtained from the patient himself. Otherwise a *stock vaccine*, in which the organism has been obtained from another patient suffering from the same disease, is used.

The object of injecting the dead bacteria into the tissues is to stimulate the latter to produce antibodies. Then should the person be exposed to infection and some live germs obtain entrance, these antibodies would act on them in the ways already described, and so enable the phagocytes to deal more readily with them. As long as his cells retain the power of producing these antibodies, the person has " active immunity " to the disease.

Typhoid vaccine was most successful in preventing typhoid fever among the troops in the war of 1914-18. In other diseases, however, vaccines have not always proved so useful.



Heart Table.

PART IV.—MEDICAL NURSING.

CHAPTER XV.

DISEASES OF THE HEART AND VASCULAR SYSTEM.

The general symptoms of heart diseases, and the features of heart failure, are described in this chapter under the heading of Chronic Heart Disease. The pulse was dealt with as regards its rate, character, and rhythm on p. 93 *et seq.*

I. Pericarditis.

When the pericardium becomes inflamed, its inner surface loses its smoothness, becoming covered with flakes of lymph. Simultaneously, the quantity of fluid which the pericardium contains rapidly increases, until sometimes it amounts to as much as 2 or 3 pints. In other cases there is little or no pericardial effusion.

Should the patient recover, the flakes of lymph are partially or entirely converted into fibrous tissue, which glues the pericardium to the heart.

Pericarditis may be caused by rheumatism, Bright's disease, pyæmia, scarlet fever, &c.; or inflammation may spread to the pericardium from the adjacent pleura.

Symptoms.—In a well-marked case the patient com-

plains of pain and a feeling of oppression in the region of the heart. These symptoms are in great measure due to the lymph and excess of fluid in the pericardial sac, both of which impede the working of the heart and render it more difficult. The pulse and temperature are raised, the expression anxious, the respirations rapid and shallow, and there is a short troublesome cough.

Nursing and Treatment.—This is a disease in which *absolute rest* is of the utmost importance. For not only is the heart hampered by the lymph or fluid, but its muscle is to a greater or less extent invaded by the inflammatory process.

To make its work as light as possible, the patient must therefore be kept in the recumbent or semi-recumbent position. He must not be allowed to talk; and he must be guarded against anything in the nature of excitement or worry. For the relief of the pericardial pain and distress, some physicians apply leeches; others use a light mustard-and-linseed poultice, or an ice-bag carefully suspended.

II. Acute Endocarditis.

This is an inflammation of the membrane lining the cavities of the heart, and chiefly affects the valves. It occurs most commonly in cases of acute rheumatism and chorea.

Complete rest in the recumbent position must be secured for a long period. At first the patient must not even be allowed to feed himself. Sometimes blisters are applied over the heart.

III. Chronic Heart Disease.

Rheumatism and chorea are the most frequent causes of chronic heart disease.

Valvular Disease.—As a result of inflammation, the valves may become distorted, and, narrowing the opening, obstruct the flow of blood, as in *mitral* or *aortic stenosis.*

On the other hand, they may become incompetent, allowing the blood to flow back again (regurgitate) into the cavity which it has just left; this occurs in *mitral* or *aortic regurgitation.*

Under these conditions there is more work for the muscular walls of the ventricles to do, and this leads to a compensatory *hypertrophy* of the cardiac muscle. If the hypertrophy is sufficient to allow the heart to carry on the circulation in a normal way, the disease is said to be "fully compensated." Hypertrophied muscle, however, is liable to undergo fatty degeneration, especially during an attack of influenza and other infective diseases; the heart then *dilates,* and evidence of insufficient compensation appears in the form of shortness of breath, œdema, or fainting.

The commonest form of valvular disease is mitral regurgitation. Mitral stenosis affects females more than males; aortic regurgitation, in which sudden death is liable to occur, is more common in men. Aortic stenosis is rare.

In **Ulcerative** or **Infective Endocarditis,** the tissues of the inflamed valves break down and form ulcers, on which fibrin is deposited as "vegetations." Little pieces of these may break off, and be carried away in the blood-stream until they reach a vessel through which they cannot pass, and so give rise to *embolism.* The embolism may be in the spleen (pain in side), kidneys (pain and hæmaturia), brain (paralysis, aphasia), or retina (optic neuritis). The condition is almost always due to the implantation of sepsis, derived, for example, from an attack of pneumonia, osteomyelitis, specific fevers, &c., on an old diseased valve.

Fatty Degeneration and **Infiltration** may give rise to no symptoms until heart failure occurs; or there may be shortness of breath, attacks of syncope, and slight swelling of the feet.

General Symptoms of Heart Disease :—

Palpitation.—This is one of the earliest symptoms. Owing to the dilated condition of the heart, its beats

are now obvious to the patient. On the other hand, palpitation often occurs in people whose hearts are sound.

Dyspnœa, or shortness of breath.—At the commencement of the illness this is only noticed on exertion. As the disease progresses, it becomes more marked, and in the later stages it is very distressing.

Cyanosis.—This is a bluish discoloration of the skin and mucous membranes, from deficient oxygenation of the blood, caused by respiratory or circulatory disturbances (bronchitis, pneumonia, heart disease). It is evident to an increasing extent as compensation fails, and is most apparent at the periphery of the circulation, the fingers, toes, and ears ; also the face and lips.

Pain.—A varying amount of cardiac pain and distress is a common symptom of heart disease.

Dropsy.—When a valve is diseased, or prevented by dilatation of the heart from closing the opening it guards, some blood flows backwards as well as forwards when the organ contracts. As a result, this backward-flowing stream meets and obstructs that which is entering the heart from the great veins. There is in consequence a slowing of the current throughout the whole venous system. Now, the veins and lymphatics drain away from the tissues the fluid which is continually oozing into them from the capillaries. If, therefore, these drains are partially blocked, an excess of fluid will remain in the tissues. The swelling resulting is called *œdema*. A *general œdema* is also called *dropsy*. Subcutaneous dropsy, which " pits " on pressure, is known as *anasarca ;* fluid accumulating in the abdomen is *ascites*, and in the pleural cavities, *hydrothorax*. *Local œdema* may occur around an inflammatory focus.

Cardiac dropsy shows itself first in the feet, owing to the fact that the blood has to flow uphill to the heart when we are standing. As the heart gets weaker, the dropsy spreads upwards till it reaches the abdomen, fluid appearing in that cavity, and later in one or both sides of the chest.

Hæmoptysis.—This appears in the later stages of heart disease, being due to stagnation of blood in the lungs.

Faintness, which is by so many people regarded as certain evidence of heart affection, as a matter of fact rarely occurs in that disease, whereas it is a common symptom of anæmia.

Nursing and Treatment.—The first and most important element in the treatment is *rest*, both of the mind and body. Mental excitement and worry throw extra work upon the heart equally with physical exertion. The patient should not be allowed to do anything for himself. If he wishes to change his position in bed, the nurse must do it for him. He should do but very little talking.

In the early stages of heart disease, when there is acute inflammation of one or more valves, or of the muscle of the organ, the patient should at all times strictly maintain the recumbent position. *In the later stages*, when the heart has given way and the lungs are engorged with blood, the resulting dyspnœa renders such a position impossible. The patient must now have a water pillow, and be propped up in bed with a horse-hair pillow or a bed-rest ; a feather pillow is needed for the head, with one lengthways down the back or two arranged like an inverted V, thus supporting the shoulders and arms. The head of the bed may be raised on blocks, and if necessary a bed table, covered with a pillow, may be provided for leaning on. When dropsy becomes marked many patients are not able to use their beds at all, but spend whole days and nights sitting upright in an arm-chair. This attitude allows the fluid to drain from the upper to the lower parts of the body, so that the heart and lungs can work more easily.

In a chapter such as this it is impossible to do more than mention the fact that carefully *graduated exercises* (p. 624) are sometimes used in the treatment of certain forms of heart disease, the object being to increase the tone and strength of the heart muscle by gradually increasing its work.

The *diet* must be light and as digestible as possible. A deficient supply of blood to a part means that it cannot do as much work as formerly. It is useless, therefore, to

expect the stomach and intestines to digest the same food that they could in health. At the same time, it is unwise to give the patient an excess of fluid, since that will only increase the fulness of the blood-vessels, and so add to the dropsy (p. 57). When there is much œdema, a salt-free diet (p. 60) is often helpful.

The *bowels* need careful attention. It is important that there should be no straining during their action; otherwise, the effect upon the heart may be most serious. It is always better, unless the bowels are opened quite easily, to give an aperient or an enema. If there is much œdema, a purgative such as jalap powder is chosen, since that produces a watery evacuation and so helps to drain away some of the surplus fluid from the tissues. In other cases, with marked enlargement and tenderness of the liver, calomel is given, since it acts especially upon that organ, and diminishes the pain set up by its very congested condition in bad heart disease.

Vomiting is sometimes very troublesome. It may be caused by digitalis (see p. 211), if that drug is being given; or it may be a direct result of the cardiac condition, in which case it is a very serious symptom.

When *œdema* of the lower extremities becomes marked, and there is also fluid in the abdomen, and, possibly, in the pleural cavities, some of it may be removed by making three or four punctures aseptically with a surgical needle in the lower and outer side of each thigh or leg. Instead of using a needle, a very fine silver tube, called "Southey's tube," is sometimes inserted, and left in position with a long piece of drainage-tube attached to it, the end being placed in a basin of antiseptic lotion on the floor. As the thighs are emptied the fluid drains into them from the abdomen. When there is a marked accumulation of fluid in the chest or abdomen, it also is drawn off. In the latter case the abdomen is afterwards supported by a many-tailed bandage.

As regards *drugs*, when there is œdema such medicines are given as will increase the quantity of fluid removed

from the system by the kidneys and bowel. If the heart is beating in a rapid, weak, and irregular manner, digitalis is administered, it being a drug which makes the beats slower, stronger, and more regular. When lividity and dyspnœa are marked, blood is removed either by means of *venesection* or by *leeches*, and thus the over-distended heart is relieved.

The administration of oxygen does much to render these patients more comfortable, air being their constant need and one desire. In cold weather care must be taken that the temperature does not fall below 60°, and that the patient is shielded from draughts, or his restlessness may lead to his taking a chill.

IV. Angina Pectoris.

This is a special form of cardiac pain which comes on suddenly, is of extreme severity, and often proves fatal. Its exact nature is still undecided, some physicians looking upon it as a kind of cramp of the heart muscle. During an attack of angina there is an intense feeling of tightness in the chest, with pain, which also spreads down the arm. The patient feels unable to move, and in severe cases there is a sense of impending death. After lasting a short time, the attack passes off, to recur again later on. It is most common in men above middle age.

Treatment.—The drug that has most influence in relieving this very serious and fatal form of heart pain is nitrite of amyl. This is usually put up in small glass capsules, one of which is crushed in the folds of a handkerchief, and the vapour inhaled by the patient. It acts upon the smaller arteries, causing them to dilate and thus allow the blood to pass more freely through them, and in many cases at once relieves the pain. Nitro-glycerine produces a similar effect; it acts more slowly, and is taken internally. In very severe cases, not relieved by either of the above drugs, the physician injects morphine, or gives the patient chloroform to inhale.

V Aneurism.

This term is applied to a local dilatation of an artery. Owing to injury, or disease of its inner and middle coats resulting from syphilis, the wall of the vessel is weakened at one point. The pressure of the blood, acting on that weak spot, causes it to bulge, so that eventually a sac is formed communicating with the artery. This sac goes on increasing in size, until a cure is effected or death results.

Symptoms.—When occurring in a limb, the most obvious sign is a pulsating swelling. When occurring internally, symptoms are produced by the pressure of the swelling on adjacent structures; for as an aneurism increases in size, it makes room for itself by pushing aside the neighbouring organs, and when it comes in contact with bone, by wearing it away.

The most serious form of aneurism, from a medical point of view, is that which occurs in connection with the *aorta* soon after it has left the heart. Here the swelling is situated in the midst of very important structures. It may cause difficulty of breathing, by pressing on the windpipe; difficulty of swallowing, by obstructing the gullet; and pain, by eroding the vertebræ and pressing on the nerves. The pain caused by an aneurism is frequently very severe. Unless cured, an internal aneurism eventually bursts; or else the patient is worn out by pain and dies of exhaustion.

Nursing and Treatment.—In a limb the surgeon is able, by ligaturing the vessel immediately above the aneurism, to check the flow of blood through it and so to allow a clot to form.

To internal aneurisms this form of treatment is inapplicable. All that can be done is to place the patient under conditions as favourable as possible to the formation of a clot in the sac. He must be kept absolutely *at rest* in the recumbent position, doing nothing for himself, and at the same time be guarded from all mental strain and anxiety. He should be put on a carefully regulated *diet*, which

contains a smaller quantity of fluid than normal. Of *drugs* the most important is iodide of potassium, which appears to have a special influence on the coagulation of blood in aneurisms. Morphine is often necessary for the relief of pain.

VI. Arterio-sclerosis.

This is a thickening and degeneration of the arterial coats, usually associated with, or due to, high blood-pressure and chronic nephritis. It is almost invariably present in old age.

Symptoms.—These may be *cardiac* (aortic regurgitation, angina, cardiac failure), *cerebral* (vertigo, headache, deficient memory, dementia, cerebral hæmorrhage), *renal* (small granular kidney).

Treatment.—General hygienic life. Potassium iodide may relieve the high blood-pressure.

VII. Anæmia.

Anæmia literally means "bloodlessness," and is a term that is used when the blood is deficient in either quality or quantity. It may be due to insufficient food, want of fresh air, and overwork; or it may be the direct result of hæmorrhage, or some chronic wasting disease.

One form of simple anæmia, known as *chlorosis*, occurs in girls and young women, though less commonly in recent years than formerly. When the blood of such patients is examined, it is found to contain fewer red corpuscles than normal, and especially to have less hæmoglobin than it should; that is to say, there is a deficiency of colouring matter in the red blood-cells.

The various organs, being improperly nourished, do their work badly. Hence we have palpitation and shortness of breath on exertion, liability to fainting attacks, pain after food, constipation, and muscular weakness and languor.

The skin is of the colour of wax, the lips a pale pink, the ends of the fingers white, and the temperature sub-normal.

Pernicious Anæmia is a rare and very dangerous form of anæmia, occurring, as a rule, in patients nearer middle age. As contrasted with chlorosis, the changes in the blood are of a different nature, the red cells being reduced in number to a greater extent than the hæmoglobin. The temperature also is usually raised above normal, and a fatal termination is the rule.

Nursing and Treatment.—For *simple anæmia* rest in bed is of the highest importance, combined with iron, a plentiful supply of suitable food, and laxatives when necessary.

In *pernicious anæmia* arsenic seems to do more good than iron. Salvarsan is sometimes injected. Rest in bed is necessary, and septic teeth should be extracted. Some good results have followed transfusion of blood, from 500 to 800 c.c. being transferred from donor to recipient.

VIII. Other Diseases of the Blood.

Splenic Anæmia is a chronic disease of unknown origin, in which the spleen is enlarged, and there is anæmia of the chlorotic type. The leucocytes are normal or decreased in number. It generally occurs in the young, and its course is slow. It is treated by rest and a generous diet. In some cases removal of the spleen (*splenectomy*) has effected a cure.

Leukæmia is a disease of the blood-forming tissues (bone-marrow and lymphoid tissue, spleen and lymphatic glands). It gives rise to marked enlargement of the spleen, anæmia, œdema of the legs, and wasting. The blood shows a large increase in the number of leucocytes and a decrease in the hæmoglobin. Recovery never occurs. X-rays and arsenic are used in treatment.

Henoch's Purpura is purpura (extravasation of blood into the skin) with colic. It is characterised by a purpuric rash associated with severe abdominal colic, diarrhœa, vomiting, or constipation; there may be melæna and joint pains. It has to be distinguished from appendicitis and intussusception. It tends to relapse.

CHAPTER XVI.

DISEASES OF THE RESPIRATORY SYSTEM.

General Symptoms of Respiratory Disease.—The various types of breathing, cough, and expectoration are described in Chapters V. and XI.

I. Laryngitis.

Hoarseness of voice, which is the earliest symptom of laryngitis, is due to the inflammation interfering with the movements of the vocal cords. Dyspnœa is caused by swelling of the sides of the glottis, the narrow chink-like opening by which air enters the larynx.

The symptoms, treatment, and nursing of acute laryngitis are described in the chapter on diphtheria, and need not be repeated here.

Tuberculous Laryngitis is practically always secondary to pulmonary tuberculosis. It begins with huskiness and irritation; hoarseness and aphonia gradually develop, and the pain on swallowing (*dysphagia*) may be agonising. Complete silence for many months is necessary, and the larynx may be sprayed with menthol and olive-oil. In dysphagia, the food should be semi-solid; spraying with cocaine may be required before meals, or the patient may hang his head over the edge of the bed and suck his food through a tube.

Tracheitis, or inflammation of the trachea, often accompanies laryngitis and bronchitis.

II. Bronchitis.

Symptoms.—In *bronchitis* (inflammation of the bronchi) the mucous membrane in certain of the bronchial tubes, being inflamed, becomes swollen, so that air does not pass through those tubes as readily as it previously did. This produces a feeling of tightness or stuffiness in the chest. The irritation of the bronchial mucous membrane gives rise to a frequently recurring "dry" cough. There is also a varying degree of fever, more marked in children than in adults. Expectoration is at first very scanty; but soon an abundance of frothy mucus, secreted by the glands of the mucous membrane,[1] is coughed up, which, as the inflammatory condition progresses, becomes mixed with pus. In very severe cases, in which the finest bronchial tubes are affected, and more or less blocked by the swelling of the mucous membrane, there is marked cyanosis, with dyspnœa and high fever. This is called *capillary bronchitis*, because of the very small size of the bronchi which are inflamed, and is an extremely dangerous condition, especially in young children.

When the cough becomes "loose," the feeling of tightness about the chest to a large extent passes off, and the patient is more comfortable. That is because the congestion and swelling of the bronchial tubes have been relieved by the outpouring of fluid.

Nursing and Treatment.—In the early "dry" stage a warm moist atmosphere soothes the inflamed and irritable mucous membrane. A mustard-and-linseed poultice, applied to the front and sides of the chest, will certainly diminish the feeling of tightness and oppression. For children it is important that the poultice should be made as light as possible. Such drugs as are given at this time tend to promote the secretion of mucus by the bronchi and also to liquefy it, so that it may be the more easily coughed up. When the cough becomes "loose," poultices are usually discontinued, and a cotton-wool jacket put on.

[1] A *secretion* is the material manufactured from the blood by a gland and poured out by it.

If the patient is placed in steam, it is of great importance that the temperature of the room should not be allowed to fall either by day or night, otherwise he may take a chill owing to the dampness of his surroundings. In the acute stage it should be kept as nearly as possible at about 60°.

III. Broncho-Pneumonia.

From the bronchial tubes air passes into small chambers which are lined all round with air-cells, in the walls of which run the pulmonary blood-vessels. When the inflammation affects these air-chambers, the patient is said to have pneumonia.

Broncho-pneumonia, as the word signifies, means a combination of bronchitis and pneumonia. The inflammatory process spreads from the very fine bronchial tubes into the air-chambers with which they are connected, so that the latter become filled with the products of inflammation, which therefore take the place of air. This is the form of pneumonia which is most commonly met with in children and old people.

Symptoms.—In a young child there is but little difference between the symptoms of acute bronchitis and broncho-pneumonia. If the finer bronchial tubes are extensively affected, there is laboured respiration, cyanosis, restlessness, and a short frequent cough. If there is much pneumonia and but little bronchitis, the symptoms will approximate to those of lobar-pneumonia.

The temperature is irregular, there being a marked rise each evening, with a corresponding fall in the morning. The illness lasts from one to four weeks, or even longer, the temperature falling gradually and not by crisis.

Severe rickets and convulsions are unfavourable complications of broncho-pneumonia.

Nursing and Treatment.—Rest in bed in a warm but well-ventilated apartment (temperature 60°), with a light diet, will be necessary for every case of this ailment. The

special treatment will depend on whether bronchitis or pneumonia is the more prominent feature of the illness. The former has already been described; the latter will be taken in the next section.

IV. Acute Pneumonia.

This disease is also called "lobar" pneumonia, because it usually affects the whole or greater part of at least one lobe. In this variety the inflammation is confined to the air-cells, and does not affect the bronchial tubes. The air-chambers are filled with inflammatory products, so that the lung, from being light and spongy, becomes heavy and solid, resembling very much in appearance a piece of liver, and sinks in water. This form of inflammation of the lungs occurs at all ages, and is more common in adults than broncho-pneumonia.

Symptoms.—The onset is sudden and often marked by a rigor, the temperature rising at once to 103° or 104°, or even higher. There is often a sharp pain in the side from inflammation of the pleura which covers the affected portion of lung. Cough is short and frequent. Expectoration scanty, very tenacious, and of a rusty colour from the presence of altered blood in it. This form of sputum is characteristic of lobar pneumonia. The respirations are rapid, but the patient is free from dyspnœa, though there may be pain on inspiration from the accompanying pleurisy.

The temperature in a typical case of acute pneumonia rises suddenly, remains up for from five to ten days, and then falls abruptly by crisis to normal. In a certain number the descent is more gradual. Pleurisy, empyema, and pericarditis may occur as *complications*.

Chances of Recovery.—The following are dangerous symptoms :—

A dry tongue and delirium with only moderate fever, cyanosis, respirations persistently above 60 per minute, and pulse persistently above 120 per minute in adults. The outlook is grave when the disease occurs in patients over

sixty years of age, in drunkards, and in those who are the subjects of heart or renal disease.

Nursing and Treatment.—The great danger in acute pneumonia is failure of the heart, since a serious strain is put upon the weak right ventricle, owing to the block in the vessels of the inflamed lung. The patient should, consequently, be kept at *absolute rest*, and on no account be allowed to talk or sit up. If he is delirious, and insists on getting out of bed, it is well, however, to humour him, and after letting him walk a step or two, to endeavour to guide him back to bed again.

Patients suffering from acute pneumonia require abundance of *fresh air*. No more gas than is absolutely necessary, therefore, should be burnt in the sick-room. There is no need of steam, since the bronchial tubes are not affected. The *diet* will consist of milk, cream, beef-tea, and broths, with lemonade or iced water to quench the thirst. The nurse should remember that hot milk is more stimulating than cold milk, and also more likely to alleviate cough. Rest, fresh air, and liquids are, to put it shortly, all that is necessary for the welldoing of many cases of pneumonia. A flannel night-gown should always be worn.

If the patient is progressing satisfactorily, *drugs* are, as a rule, not given beyond a mixture in the early stage to keep the skin acting. Towards the end of the illness, should the heart show signs of weakening, stimulants, such as ammonia, strychnine, and alcohol, are administered. They are often needed at the time of the crisis. A steady rise in frequency of the pulse rate, or the appearance of lividity beneath the finger-nails, about the lips and ears, is a sure indication that the heart is feeling the strain of the illness. Alcohol is given much more freely in this disease than in enteric, since pneumonia is an illness of comparatively short duration.

Bleeding is practised when cyanosis becomes marked, with the object of making the work of the heart lighter, by giving it less blood to pump through the lungs. *Ice-bags* or ice-poultices are sometimes applied over the

inflamed portion of lung. *Antipneumococcus serum* has proved of value in some cases.

V. Pleurisy.

When the pleura is inflamed it loses its smooth shining appearance and becomes rough, owing to the deposition of flakes of lymph upon it. If the inflammatory process goes no further, the patient is said to have a *dry pleurisy;* otherwise, the next step is the pouring out of fluid by the vessels of the inflamed pleura. This fluid collects between the lung and the chest-wall. The case is now one of *pleurisy with effusion.* The fluid may be clear or purulent. If the latter, it is called an *empyema.* Empyemata occur much more frequently in children than in adults.

Pleurisy is a very common accompaniment of the different forms of inflammation of the lungs, the inflammation spreading to the surface of the organ and there infecting the pleura. Apart from this condition, pleurisy may be due to a variety of causes, among the most important of which are tubercle, cold, rheumatism, scarlet fever, and inflammation of the kidneys.

Symptoms.—With a *dry pleurisy* there is a short dry cough, and sharp, cutting, or tearing pain on inspiration, due to the rough inflamed pleura rubbing against the chest-wall. The latter is a very characteristic symptom. When there is *effusion,* this pain is absent, since the fluid separates the inflamed surfaces and prevents them rubbing against one another. Shortness of breath occurs on exertion. In *empyema* there is usually cough, dyspnœa, wasting, and prolonged pyrexia, often remittent in type.

A dry pleurisy may end by the lung becoming adherent to the chest-wall. A clear effusion is often absorbed, though sometimes the fluid has to be drawn off. An empyema almost invariably requires opening and draining.

Nursing and Treatment.—Rest in bed in a warm

room, with a light diet, so long as the temperature is raised. The bowels and skin are kept working regularly, especially when there is effusion. A leech or a mustard-leaf is usually applied for the relief of pain in a dry pleurisy, or the affected side of the chest may be strapped or tightly bandaged, so as to restrain its movements.

For *strapping the chest* the strips of plaster should be 2 in. wide and long enough to reach beyond the spine and sternum on to the sound side. They are put on from below upwards, and overlap by half their width. One nurse first applies and keeps in its place the end which crosses the spine, while her colleague carries the other end round to the front. As she does so the patient empties his chest of air, and the nurse, drawing firmly on the strapping, carries it over the sternum on to the sound side and fastens it down.

When there is a large effusion it presses on the heart, and pushes it over to the opposite side, thus seriously interfering with its working. Such cases sometimes die suddenly, owing to the heart stopping as the result of the pressure on it. For this reason, children with unopened empyemata need very careful handling. They should not be allowed to sit up in bed, or do anything which could increase the work of the heart.

The absorption of non-purulent fluid may be assisted by painting the skin over it with a counter-irritant such as tincture of iodine. If, after some time, it does not seem to be diminishing in amount, it is drawn off with the *aspirator* (p. 152).

An *empyema* is usually opened under an anæsthetic, and a piece of drainage-tubing inserted, a piece of rib often being removed. The patient is not, as a rule, kept in bed until the discharge has ceased and the wound healed, but is allowed up as soon as he is strong enough to take a little gentle exercise. This makes him breathe more deeply, and so helps to expand the affected lung (p. 545).

VI. Bronchial Asthma.

This is the term applied to paroxysmal or spasmodic dyspnœa, a condition quite distinct from renal and cardiac dyspnœa. It commonly commences under the age of ten and may persist to old age. It is more frequent in males, and is often associated with a neurotic family history. It is sometimes the result of nasal polypi or bronchitis. The exciting causes of an attack are many—*e.g.*, the condition of the climate or atmosphere, emotional disturbances, or the scents of certain flowers or animals. The latter cases appear to be due to hypersensitiveness to certain protein substances. Thus an attack of asthma may be brought on by the inhalation of minute quantities of horse protein contained in the air near horses.

Symptoms.—The attacks are most frequent at night, after a few hours' sleep. The onset is sudden ; there are violent respiratory movements with short inspiration and long wheezy expiration, but little air entry results. The patient is anxious, pale or dusky. The attack, however, is never fatal ; its duration may be from a few minutes to several hours.

Treatment.—Climate and residence must be chosen to suit the individual case ; dry moderate altitudes are often best, and towns are generally better than the country. Heavy meals in the evening should be avoided, and nasal abnormalities corrected. During a paroxysm amyl nitrite or the fumes of stramonium, burnt as a powder or cigarette, may be inhaled. Lobelia and potassium iodide are often given internally. Cases resulting from hypersensitiveness to a particular protein may be treated by injecting minute doses of the latter.

VII. Other Diseases of the Lungs.

Hypostatic Congestion occurs in enfeebling conditions such as fractures in old age, fevers (*e.g.*, typhoid), and coma (*e.g.*, apoplexy), and in cases of intra-abdominal pressure (*e.g.*, tumour, ascites). The symptoms are rapid and shallow breathing, and cyanosis. *Prevention* is most important. In typhoid and in any illness in old age, the patient should be moved every two hours from one position to another. *Treatment* consists in stimulating the heart, applying linseed poultices or antiphlogistin, and giving oxygen.

Emphysema is a condition of dilatation of the alveoli and atrophy of the alveolar walls. It is common in middle and old age, but may occur in children who suffer from asthma and recurrent bronchitis after whooping-cough. It is almost always present in chronic bronchitis, and is frequent among those exposed to strain. The symptoms are dyspnœa, cough, and cyanosis, and the chest is barrel-shaped. *Treatment* aims at preventing or alleviating attacks of bronchitis and asthma. Patients do better near the sea-level (South Coast, Madeira, Algiers). Venesection, oxygen inhalations, and cardiac tonics are required in extreme dyspnœa and cyanosis. Flatulence should be prevented by blue pill and salines.

Gangrene may result from septic broncho-pneumonia (especially "aspiration" pneumonia in diseases of the larynx or wounds of the neck), or septic embolism of the pulmonary artery. The onset is insidious, the sputum is offensive and separates into layers with greenish deposit. Recovery is rare.

Abscess may be due to aspiration pneumonia, foreign body in bronchus, or infective emboli. The constitutional symptoms are marked, with cough, dyspnœa, pain, and offensive sputum. Empyema usually results. The prognosis is grave, and treatment is drainage by operation.

New Growths are usually secondary to malignant disease elsewhere.

CHAPTER XVII.

DISEASES OF THE ORGANS OF DIGESTION.

A. *Appetite.*

Appetite depends partly on the gustatory nerves of the mouth, partly on the condition of the stomach wall, and partly on the needs of the body.

Bulimia, or excessive appetite, may be present in pregnancy and certain diseases—*e.g.*, diabetes, chronic diarrhœa, and intestinal worms. It sometimes accompanies dyspepsia.

Anorexia, or loss of appetite, occurs in gastritis and cancer of the stomach, and in toxæmic conditions, such as acute fevers, tuberculosis, and cancer. It is often present when for any reason the tongue is dry or furred. It is very common in neurasthenia.

Nausea most commonly precedes vomiting. It may be a symptom of chronic gastritis, chronic appendicitis, or worms ; sometimes it is present at the onset of pregnancy or tuberculosis.

B. *Vomiting.*

In vomiting there are usually three definite **stages ;** first, profuse salivation and nausea ; then, one or more deep inspirations, followed by closure of the glottis with contraction of the diaphragm and abdominal muscles, compressing the stomach ; finally, ejection of the vomit.

Types.—Vomiting in the early morning is often due to alcohol, pregnancy, or renal disease. That due to dyspepsia,

ulcer, or neurosis, commonly occurs after meals. In cerebral disease, it bears no relation to food, and nausea is absent. In intestinal obstruction, the vomit is at first food, then bile, then copious fæcal fluid. In peritonitis it is small in quantity and not markedly fæcal.

Its common **Causes** are: (*a*) *disorder of the stomach* (*e.g.*, dyspepsia, gastritis, ulcer, cancer); (*b*) *disease of other parts of the alimentary canal* (*e.g.*, œsophageal stricture, duodenal ulcer, intestinal obstruction, appendicitis, peritonitis); (*c*) *nervous disease* (*e.g.*, cerebral tumour or abscess, meningitis, the gastric crises of locomotor ataxy, hysteria, migraine); (*d*) *disease of other organs* (*e.g.*, nephritis, renal and biliary colic); (*e*) *various other conditions* (*e.g.*, pregnancy, constipation, onset of acute specific fevers).

The Vomit may consist of—(*a*) *Food*, partly digested; (*b*) *Fluid*, when the stomach is empty of food, either clear (as in hysteria or pregnancy), or yellow and very acid (as in biliousness or after anæsthesia); (*c*) *Blood*, in the form of altered blood ("coffee-grounds") or fresh blood (hæmatemesis); (*d*) *Fæcal fluid*, resembling beef-tea with fæcal odour (in intestinal obstruction).

Treatment.—The cause requires treatment. Relief, apart from this, may be given by the means described on p. 531.

Hæmatemesis, or vomiting of blood, if profuse is commonly due to gastric ulcer or cirrhosis of the liver. It may occur in gastric cancer or duodenal ulcer, and may follow septic abdominal operations, or it may be merely the vomiting of swallowed blood from nose or pharynx. It is distinguished from **hæmoptysis** by being vomited, instead of being coughed up; being dark, acid, and airless, instead of red, alkaline, and frothy; by the sputum not being stained for several days, as in hæmoptysis; and by being followed by *melæna*—*i.e.*, the passage of dark tarry stools.

C. *Dyspepsia.*

Except from a normal degree of appetite or a pleasant feeling of repletion, there should be no consciousness of

the presence or absence of food in the stomach. If one is conscious of the activities of the stomach, the condition may be one of *organic* disease—*e.g.*, cancer, ulcer, dilatation, or chronic inflammation of the stomach,—or it may be *functional—i.e.*, without apparent anatomical change in the stomach, in which case it is known as dyspepsia.

Causation.—Dyspepsia may be due to (1) *error in habit —e.g.*, imperfect mastication, often associated with defective teeth or hurried meals; irregular meal times; deficient exercise; work immediately after meals; constipation; bad cooking.

(2) *Error in diet:* overdrawn tea (tea should not be taken with meat, as it hardens it); excess in fluids during meals, diluting the gastric juice; excess in fats; excess in sugar, causing over-secretion of mucus; excess in vinegar; heavy pastry; hot bread; unripe fruit; high meat.

Symptoms.—Several forms of dyspepsia are distinguished: the acid, the flatulent, the atonic, and the nervous varieties. The symptoms are mainly epigastric discomfort, varying from oppression to acute pain, flatulence, vomiting, and an alteration in appetite. *Heart-burn* and *water-brash* may occur. "Heart-burn" is due to the irritating effect of the acid eructations on the œsophagus. Acid eructations lead also to excessive swallowing of saliva; this sometimes accumulates at the lower end of the œsophagus, and is suddenly returned to the mouth, a condition which is known as "water-brash." The pain is relieved by food, fluids, and alkalines, which clear the œsophagus, and dilute the acid.

Treatment consists in removing the cause, providing a suitable diet, and correcting by medicines the deficiencies in the digestive function. The teeth must be attended to, mastication should be slow and thorough, and meals regular; regular exercise should be taken, with rest before and after meals; the bowels should be opened daily.

The following are suitable articles of *diet:* chicken, mutton, and game; boiled fish, especially whiting and sole;

spinach, asparagus, and cauliflower ; farinaceous foods and toast. Indigestible articles—*e.g.*, pork, beef, twice-cooked meat, condiments, fried fish, cabbage, new or brown bread, short pastry, pies, and tarts—should be avoided ; fats and sugar should be restricted. Half a pint of hot water should be sipped an hour before meals, and the amount of fluid taken during meals diminished.

If there is much pain, vomiting, flatulence, or distension, the stomach may be washed out with bicarbonate of soda solution (one teaspoonful to the pint). This should be done on an empty stomach, morning or evening.

D. *The Stools.*

Normally, the fæces passed daily by an adult weigh 5 to 6 oz. ; by a child of one year, 3 oz. The reaction to litmus is slightly alkaline, or slightly acid. No undigested food is visible.

Abnormalities.—The nurse should note—(1) *Colour,* tarry black from blood (" malæna ") ; nearly black from iron, bismuth, charcoal ; yellow in milk diet ; clay-like when bile is absent. (2) *Consistence,* which may be liquid in diarrhœa ; like pea-soup in typhoid fever ; or " rice-water " (watery with floating flakes of mucus) in cholera. In constipation, the fæces form hard lumps, called "scybala." (3) *Offensive odour,* which is due to the putrefaction of proteins. (4) *Reaction,* which is acid when there is much decomposition of carbohydrates, as in the diarrhœa of children. (5) *Undigested food.*

She should also note the presence of —(*a*) *Excessive fat,* which occurs when the bile or pancreatic secretion is deficient : " pancreatic stools " are bulky, frothy, oily, and of light colour, as a result of deficiency of the pancreatic ferments. (*b*) *Mucus,* which comes from the colon or rectum ; it occurs in considerable quantity in colitis, and in cancer of the colon or rectum. (*c*) *Blood,* which, if red, comes from the anus or rectum (piles, rectal cancer, &c.) ; if mixed with mucus, from the colon (intussusception, dysentery, &c.) ; if black, from the stomach or small

intestine (gastric or duodenal ulcer, gastric cancer). (*d*) *Pus*, which is found in ulcerative diseases of the colon and rectum, and in cancer of the large intestine. If it is in large quantity, it is generally the result of an abscess of the appendix or broad ligament opening into the bowel. (*e*) *Worms*, also *gall-stones* and *foreign bodies*.

E. *Diarrhœa.*

Diarrhœa may be caused by excessive or improper food, especially over-indulgence in fruit or salads ; by excessive fermentation of carbohydrates, or putrefaction of proteins in the bowel ; and by irritability of the colon. It is frequently due to constipation. It may occur, as the result of congestion, in cirrhosis of the liver and chronic heart and lung disease. It occurs in tuberculous enteritis, typhoid, cholera, dysentery, and colitis, owing to ulceration of the bowel. Painful straining without the evacuation of fæces is called "tenesmus." Normally, the bowels are moved shortly after the first meal of the day ; sometimes, however, they may be moved after every meal ; this is known as "lienteric diarrhœa."

Treatment.—If there is pyrexia or weakness, the patient should stay in bed and keep warm. The *diet* should consist of semi-fluids, custards, &c., or, if the case is severe, of milk and lime-water, whey, or albumin-water. To remove the irritant, an ounce of castor-oil is often given, with twenty drops of tincture of opium if there is pain ; or compound rhubarb powder may be used. To check the diarrhœa if it continues, chalk mixture, or bismuth and opium, may be given by mouth, or starch and opium as an enema to check peristalsis. Brandy is often useful. The abdomen should be kept warm. As diarrhœa and pain diminish, the diet may be increased by eggs, milk foods, broth, and jelly.

F. *Constipation.*

Normally fæces are only present in the rectum for a few minutes before defæcation, their presence there constituting the call of nature. Constipation is delay in the evacua-

tion of fæces ; motions occurring less frequently than once in forty-eight hours constitutes constipation. It may take the form of (*a*) a slow passage of the contents through the intestine to the rectum, (*b*) delay and difficulty in emptying the rectum, or (*c*) a combination of the two. For (*b*) purgatives are of little use, and enemata are indicated.

Causation.—Constipation may be due to (1) *habits*—*e.g.*, neglect of the call of nature, sedentary life, or senility ; (2) *weakness of muscles*, the result of obesity, repeated pregnancies, or ruptured perineum ; (3) *character of intestinal contents*—the diet may be unstimulating, being deficient in vegetables, porridge, brown bread, fruit, &c., or there may not be sufficient fluid ; (4) *various causes*—*e.g.*, after diarrhœa or purgatives, lead-poisoning, neurasthenia, intestinal obstruction.

Treatment.—The patient should endeavour to secure a daily normal stool ; a short rest after breakfast often permits the stimulus to develop. Walking or other exercise should be taken, and massage and electricity are useful. The *diet* should include porridge, wholemeal bread, apples, prunes, figs, oranges, and vegetables. A glass of water should be taken half an hour before meals, especially breakfast. Enemas may be given, or the purgative which bests suits the patient taken.

G. *Colic.*

Intestinal colic is abdominal pain occurring in paroxysms of short duration. It occurs when the bowel contains indigestible or decomposing food, unripe or over-ripe fruit, purgatives, or other irritants ; or it may be a symptom of enteritis, dysentery, and appendicitis ; or it may be due to flatulence. The pain is sudden and severe, doubling the patient up, and may cause nausea, sweating, and pallor. Abdominal tenderness is often absent.

Treatment.—If there is no diarrhœa, a large soap-and-water enema may be given. If diarrhœa is present, castor oil ½ fl. oz. with liq. opii sedativus 10 min. will generally

relieve the condition. Hot bottles or fomentations and gentle massage with the palm of the hand often afford relief.

H. *Jaundice.*

Jaundice is a symptom, not a disease. It is readily recognised by the yellow colour produced by the deposit of bile pigment in the sclerotic, the skin, and the mucous membranes. There are two kinds—the toxic, and the obstructive.

Toxic jaundice may be due to certain poisons, such as T.N.T., phosphorus, snake-venom, and chloroform in "delayed chloroform poisoning"; to certain toxæmias, as those of pregnancy and sepsis; and to certain tropical diseases, such as malaria and yellow fever.

Obstructive jaundice may be due to obstruction of the ducts by gall-stones within, or tumours without; or to inflammatory swelling of the mucous membrane blocking the common bile-duct, as in "acute catarrhal jaundice" (see p. 283). The yellow colour of the tissues and the greenish tint of the urine result from the presence of bile in the blood. Clay-coloured stools, often large and offensive, are the effect of the absence of bile from the intestine. Constipation, itching, and nervous depression or irritability are often troublesome symptoms. For *test for bile*, see p. 111.

I. Diseases of the Mouth.

Stomatitis, or inflammation of the mucous membrane of the mouth, may be—

(*a*) **Aphthous,** or **Ulcerative,** in children after fevers or gastric trouble. Multiple small ulcers are present on lips, cheeks, and edges of tongue.

(*b*) **Thrush,** due to a fungus, in children and weak adults; tongue, cheeks, and palate may become covered with white membrane.

(*c*) **Cancrum Oris,** or **Noma,** in weak children following measles. The sloughing on the inner side of the cheek spreads rapidly, and as a rule death occurs.

(*d*) **Ptyalism,** due to susceptibility to mercury. The gums are spongy, breath foul, and teeth loose.

In aphthous stomatitis, the mouth should be washed with hydrogen peroxide lotion, or tincture of myrrh and borax. Potassium chlorate is useful, both internally and as a mouth-wash, in ulceration ; and glycerine and borax locally in thrush. Cancrum oris requires resection of the tissues, and the application of strong antiseptics. In ptyalism, the mercury should be stopped, and an alkaline mouth-wash used. Tonics and suitable food are required.

Pyorrhœa is a purulent discharge from the sockets of a few or many teeth. Absorbed toxins give rise to anæmia, dyspepsia, and rheumatoid arthritis. Local antiseptic applications and vaccines may be tried, but generally extraction is eventually required.

II. Diseases of the Œsophagus.

1. **Stricture** may follow swallowing a corrosive poison, or result from pressure by an aneurism or a tumour, but most frequently it is due to cancer.

2. **Cancer** occurs mostly in men, and leads to progressive difficulty in swallowing, and eventually regurgitation of unaltered food ; there is usually pain, and the patient rapidly emaciates. The diagnosis can be confirmed by the passage of a bougie, or by the X-ray examination of a bismuth meal. It is treated by early gastrostomy.

III. Diseases of the Stomach.

1. **Gastritis,** or inflammation of the gastric mucous membrane, may be acute or chronic.

(*a*) The *acute form* is usually due to errors of diet, such as food excessive in quantity, or too rich, or decomposing. Anorexia, vomiting, headache, and pyrexia may occur. The patient should be kept warm ; castor-oil or calomel is

usually given; vomiting may be assisted by drinking warm water; while the diet should be limited to soda-water at first, and later diluted milk.

(*b*) The *chronic form* is usually a sequel of recurrent attacks of acute gastritis. The symptoms and treatment are those of dyspepsia.

2. **Peptic Ulcer.**—Ulceration is apt to occur on mucous membranes which habitually come in contact with the acid gastric juice—*i.e.*, those of the stomach (*gastric ulcer*) and the first part of the duodenum (*duodenal ulcer*). The ulcer may be acute or chronic. Acute gastric ulcer, the first symptom of which is often hæmorrhage (hæmatemesis and melæna), is commoner in women. Chronic gastric ulcer is equally common in both sexes. Chronic duodenal ulcer is much commoner in men.

The *cause* is not known. Patients have often led a strenuous life, involving irregular meals, and in duodenal ulcer there is often an excess of hydrochloric acid in the gastric juice. Sepsis from teeth, appendix, or gall-bladder may be a cause.

In *chronic gastric ulcer* the pain is epigastric, beginning a half to two hours after a meal; the vomit consists of food, often with a little altered blood resembling coffee grounds. In *chronic duodenal ulcer* the pain is felt a little to the right, and comes on later, two to four hours after food, or wakes the patient up in the early morning; it is relieved by taking food, and so has been called "hunger-pain." Vomiting may occur, and hæmorrhage may be severe.

In cases with no visible hæmorrhage, very minute quantities of blood ("occult" blood) can be found by laboratory examination. When a specimen of fæces is put up for the purpose of this delicate test, the patient should have eaten no meat or fish for at least two days. X-ray examination of a barium meal is a valuable aid to diagnosis. The disease has to be distinguished from gastritis and gastric cancer.

Complications.—Apart from the danger of severe hæmorrhage, the ulcer may perforate; this causes severe abdominal pain and shock, and unless operation is speedily performed

peritonitis or a subphrenic abscess (*i.e.*, one under the diaphragm) ensues. A large ulcer near the pylorus may in healing leave a scar which obstructs the exit, and give rise to dilatation of the stomach.

Treatment.—Give the stomach as much *rest* as possible. The patient must go to bed, and stay there until pain and occult blood have been absent for a fortnight. The *diet* must be (1) unstimulating, so as to minimise gastric secretion ; (2) rich in carbohydrates and fats and poor in protein, for the same reason ; (3) given in small quantities frequently so as not to distend the stomach. (For the Lenhartz and Sippy diets, see p. 59.) An attempt should be made at the same time to *reduce the acidity* of the gastric contents. This may be done by administering alkalies (*e.g.*, carbonates) or fat (*e.g.*, cream or olive oil). For example, a patient with duodenal ulcer may be given—between 7 A.M. and 9 P.M.—at the odd hours (7, &c.), 6 oz. milk ; and at the even hours (8, &c.) a level teaspoonful of a powder consisting of equal parts of sodium bicarbonate, bismuth carbonate, and heavy magnesium carbonate (taken in water), and, alternatively, a teaspoonful of magnesium hydroxide mixture. (Thus, the patient would have milk at 7 A.M., mixture or powder at 8 A.M., milk at 9 A.M., mixture or powder at 10 A.M., and so on.) Finally, at 10 P.M. 3 drachms bismuth carbonate may be given to limit acidity during the night.

When freedom from pain and occult blood is reached, egg and milk may be given, followed by junket and cream, custard, Benger's food, thin bread and butter, pounded fish, minced chicken, and milk puddings. Afterwards, the patient should never go without food, between breakfast and bedtime, for more than three hours. He should masticate well, and only smoke a little. Any sepsis should be dealt with. If medical treatment fails, gastro-enterostomy is commonly done.

In *profuse hæmorrhage* the patient is given morphine ; a stomach tube is sometimes passed and the contents removed with a Senoran's evacuator (p. 285), and the stomach washed out with small quantities of ice-cold or very hot water. No

food must be taken for twenty-four hours, but small quantities of water may be given. Ice should be applied to the epigastrium. If *perforation* occurs, the abdomen is opened, the peritoneal cavity cleansed, and the ulcer sutured.

3. **Cancer of the Stomach.**—This is most common after forty years of age ; in about half the cases it is situated at the pyloric opening. At first there is slight pain after food, which gradually increases in severity, and is accompanied by vomiting. As the disease progresses, the patient becomes emaciated. In some cases the pyloric opening is partially blocked by the growth, in consequence of which the weakened organ, being unable to empty itself, gradually dilates. As a result, large quantities of undigested fermenting food collect in it, which the patient vomits perhaps every second or third day.

Treatment.—In a few cases a cure is effected by removal of the growth. In the majority nothing can be done beyond making the patient as comfortable as possible. When there is marked obstruction of the pylorus by a growth which cannot be removed, relief is afforded by making an opening into the upper part of the small intestine and stitching it to another in the wall of the stomach, thus providing the contents of that organ with a passage by which they can easily pass into the bowel (*gastro-enterostomy*).

Daily washing out of the stomach is useful when there is vomiting with considerable dilatation. The removal of its foul contents diminishes the severity of the vomiting, besides increasing the patient's appetite and digestion. It should be done a short time before a meal.

A patient who is suffering from gastric cancer needs careful dieting. He is given such food as he relishes and can most easily digest. Pain is relieved by morphine.

IV. Diseases of the Intestine.

1. **Duodenal Ulcer.**—See p. 276.
2. **Appendicitis.**—The vermiform appendix is a rudi-

mentary portion of bowel 4 to 6 in. long, and about the thickness of a large quill. One end of it is blind; the other is connected with the back part of the cæcum, which is situated in the right side of the abdomen, above the groin. When this little piece of bowel is inflamed, the patient is said to be suffering from appendicitis.

Symptoms.—Pain and tenderness in the right iliac fossa, constipation, and in some cases vomiting. The channel of the appendix being very narrow, it is quickly blocked by the products of inflammation, which consequently collect within it and distend it. The symptoms may now subside, or they may go on until an abcess is formed, or the wall of the appendix may give way, and its contents escape into the abdominal cavity, setting up an acute inflammation of the peritoneum, which adds greatly to the gravity of the case.



Interior of Cæcum.

Below is seen the small opening which leads into the appendix, and above that the ileo-cæcal valve. Through the latter an arrow has been passed from the ileum.

Nursing and Treatment.—In view of the excellent results of early operation, and of the fact that it is often impossible to judge whether an inflammation of the appendix is going to subside without suppuration or perforation, the majority of surgeons at the present time operate as soon as the diagnosis of appendicitis is definitely made (see p. 538). It is of the utmost importance that perforation of the appendix should not be overlooked, for this is an accident which increases tenfold the risk to the patient. The nurse who is

in charge of such a case must carefully watch for and at once report any symptoms, such as a rigor with marked rise of pulse and temperature, pointing to an extension of inflammation from the appendix to the general peritoneal cavity. General abdominal distension is another dangerous sign, but worse still is a *sudden relief of pain* with a marked increase in the rapidity of the pulse. This is frequently the result of the appendix having become gangrenous, a condition which calls for immediate operation.

3. **Intestinal Obstruction.**—This most dangerous condition may be brought about in many ways. The bowel may be blocked by a large gall-stone ; or a coil of gut may become twisted upon itself ; or it may slip under a band or adhesion, which consequently presses upon it and prevents the passage through it of its contents ; or there may be an intussusception. *In children,* the common causes are intussusception and tuberculous ulceration and adhesions. A *chronic* obstruction—that is, one gradually coming on—may be caused by a cancerous tumour in the bowel-wall, a syphilitic stricture, or impacted fæces.

The symptoms may develop with the utmost acuteness ; or they may come on gradually, lasting several days, or even weeks, before the obstruction becomes complete.

Symptoms.—The symptoms of acute obstruction are intense abdominal pain, vomiting, and constipation. The pain is usually referred to the region of the umbilicus. Vomiting is continuous, at first consisting of the contents of the stomach ; later it becomes bilious, and finally stercoraceous—that is to say, fæcal in character. Constipation is absolute, neither fæces nor gas being passed by the bowel. At the same time the abdomen becomes more and more distended. Each of these symptoms results directly from the sudden and complete blocking of the intestine.

The patient quickly becomes collapsed, with sunken eyes, an anxious expression, small pulse, and a dry tongue. Unless relief is afforded, death ensues in less than a week from exhaustion or peritonitis.

Nursing and Treatment.—In acute obstruction the only

chance of saving the patient's life lies in opening the abdomen and removing the cause of the obstruction. When a piece of bowel is twisted on itself, or tightly nipped by a band, its circulation is stopped; this means that it will die, unless an operation is very soon performed. Until the obstruction is relieved, it is worse than useless to feed the patient by the mouth, as it will only be so much more for him to vomit. He may be allowed small pieces of ice to suck, and water with which to wash out his mouth. If any food is given him before an operation is performed, it should be by the rectum. For the relief of pain, a fomentation may be ordered for the abdomen. While the diagnosis is doubtful, no drugs or food should be given, and the patient should be kept at rest. The stomach may be washed out; indeed this should be done in all cases before operation. The nurse will be expected to know whether the patient has passed any flatus by the bowel.

V. Diseases of the Liver.

1. **Passive Congestion** is due to back-pressure in the blood-supply, resulting from chronic heart or lung disease. It may cause considerable enlargement of the liver ("nutmeg" liver).

2. **Amyloid Disease** occurs as part of a general amyloid disease in young adults suffering from chronic suppuration, generally resulting from tuberculosis. The liver is enlarged, the spleen is often palpable, and albuminuria is generally present.

3. **Cirrhosis** is a chronic degeneration of the liver, due to the prolonged ingestion of alcohol, and characterised by an increase of the fibrous tissue of the liver. It is commonest between forty and fifty years of age, and affects males more than females. It gives rise to dyspepsia, anorexia and morning vomiting, profuse hæmatemesis, slight jaundice, and ascites. The treatment in the early stages consists in encouraging a regular and moderate life, with a moderate diet and no alcohol. For the hæmatemesis,

morphine may be injected; and the ascites may require tapping.

4. **Abscess** may be *solitary*, in which case it is usually due to amœbic dysentery; or *multiple*, due to pyæmia, the primary focus being a septic appendix, suppurating hæmorrhoids, or a suppurating gall-bladder.

5. **Cancer** is common, and is generally secondary to a growth in the stomach, rectum, or colon. It causes progressive enlargement of the liver, with emaciation and often permanent jaundice.

VI. Diseases of the Gall-Bladder.

1. **Cholecystitis,** or inflammation of the gall-bladder, may be acute or chronic.

(*a*) The *acute form* is usually due to gall-stones; sometimes it is a sequel of typhoid fever. It may go on to suppuration. The pain over the liver is severe and paroxysmal; tenderness is marked near the ninth rib; jaundice is absent and the liver is not enlarged. The treatment is that of catarrhal jaundice. When suppuration occurs, there are the signs of sepsis—rigors, high temperature, prostration, &c.; immediate operation is required.

(*b*) The *chronic form* is a sequel of gall-stones, or it may follow acute cholecystitis. There are attacks of pain, like mild biliary colic, with nagging pain in the intervals. The treatment is as for gall-stones.

2. **Cancer** is generally a primary growth in the gall-bladder or bile-ducts. The usual age is fifty-five to sixty-five years, and it is more common in women. Pain, jaundice, and a tumour are the principal symptoms; death occurs six months from the onset of the jaundice.

3. **Gall-Stones** are, as a rule, formed in the gall-bladder. They occur more frequently in women than in men, and are more common in advanced life. They vary in size from mere sand to a hen's egg, and in number from one or two to several hundreds. There may be no symptoms even when the gall-bladder contains a large number of

stones. When, however, one of them leaves the gall-bladder and enters the bile-duct, the patient is seized with a sudden attack of "biliary colic," due to the stretching of the walls of the duct by the stone, and their contracting upon it in the attempt to force it downwards. There is intense pain over the right lower ribs in front, passing through to the back, with vomiting and collapse.

Jaundice occurs in most cases, beginning from a few hours to two or three days after the onset of pain. It probably arises from inflammatory swelling, and is usually transient.

Treatment.—Biliary colic, when mild, is treated by the application of fomentations to the seat of pain, or by placing the patient in a hot bath. Severe cases need the hypodermic injection of morphine. Operative measures are indicated in cases of frequent recurrence of pain, or persistent jaundice, or septic symptoms.

VII. Diseases of the Bile-Ducts.

1. **Catarrhal Inflammation** (*Catarrhal Cholangitis*), commonly called "acute catarrhal jaundice," is due to an obstruction of the common bile-duct, resulting from inflammatory swelling of the mucous membrane at its termination. It occurs most frequently in children and young adults. It may be due to indigestion, cold and exposure, or sometimes to chronic heart disease, or nephritis; occasionally it occurs in pneumonia. It usually clears up in two to five weeks. It is treated by rest in bed and warmth. The *diet* should be fluid at the onset; fats should be avoided, and progress in food should be gradual—*e.g.*, broth, milk, gruel for one to three days, then Benger's food, milk puddings, custard, and eggs, and later, boiled fish. Calomel may be given, followed by a saline in the morning. Gastric sedatives, such as bismuth, are usually prescribed.

2. **Suppurative Inflammation** (*Suppurative Cholangitis*) is generally the result of gall-stones. The symptoms are those of severe sepsis; the mortality is high, and the treatment immediate operation to evacuate the pus.

VIII. Diseases of the Peritoneum.

1. **Acute Peritonitis** may be set up by extension of inflammation from one of the abdominal viscera, by perforation of the stomach or intestines with escape of their contents into the abdominal cavity, or by injury. Occasionally symptoms of peritonitis develop within twenty-four hours when the intestine has been opened by operation. In many cases the inflammation spreads rapidly over the whole of the peritoneum, causing a general acute peritonitis ; in others the process is circumscribed or shut off by the gluing together of coils of intestine. The former is, naturally, much the more dangerous.

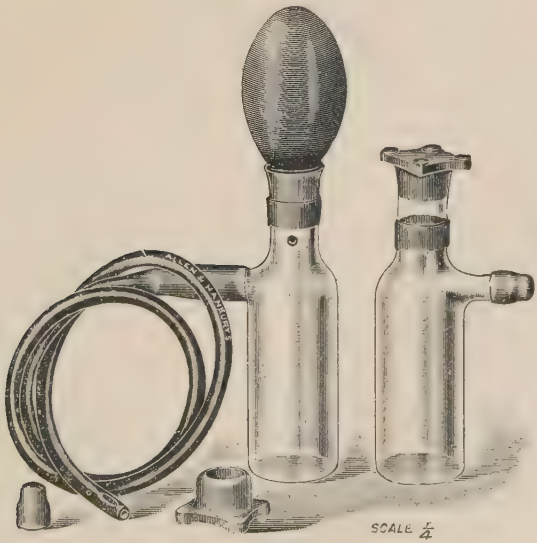
Symptoms.—Of these the most constant are increasing distension of the abdomen and increasing frequency of the pulse. There is great pain and tenderness of the abdomen at first, due to the rubbing of the inflamed surfaces of peritoneum on one another whenever the patient moves or breathes. Hence, he lies in bed with his legs drawn up to relax the abdominal muscles, breathing only with his chest. His expression is anxious, tongue dry, eyes sunken, temperature raised, and pulse rapid and small. The bowels are usually constipated, while vomiting and hiccough are troublesome symptoms. In cases where pus forms within the peritoneum, there is less pain and discomfort, owing to the separation of the inflamed surfaces by the fluid.

Nursing and Treatment.—This will vary with the cause of the peritonitis. Cases due to perforation of a gastric or intestinal ulcer, if seen early enough, are treated by operation. A pillow should be placed beneath the knees, and the weight of the bedclothes kept off by a cradle. The bowels are opened by turpentine enemata, and normal saline solution is continuously administered by the rectum. The patient's mouth should be frequently cleansed by the nurse, and she should see that his extremities are kept warm.

2. **Tuberculous Peritonitis** occurs especially in young children ; infected milk is probably its origin, for in nearly

half the cases the bacilli are of the bovine type. In adults it is commoner in women, owing to infection from the Fallopian tubes. There are two types: the *ascitic*, characterised by the large amount of fluid; and the *plastic*, in which the amount of fluid is small, and tumours and irregular masses (formed by rolled-up omentum, enlarged glands, and fæcal accumulations) common. There is generally progressive loss of weight, slight pyrexia, and prolonged slight diarrhœa. It is often *complicated* by tuberculous ulceration of the bowel, and tuberculosis of the lungs or bronchial glands may be present.

Treatment.—Complete rest is required as long as the temperature is irregular. Nourishing and fatty food and cod-liver oil should be given unless there is diarrhœa, and change to the seaside or country is important. Sometimes mercurial inunction is applied to the abdomen. Heliotherapy and actinotherapy are helpful.



Senoran's Stomach Aspirator (*see p. 277*).

CHAPTER XVIII.

DISEASES OF THE URINARY ORGANS AND SKIN.

A. The Urinary Organs.

The Kidney is composed of an immense number of little tubules lined with cells, whose business it is to pick out of the blood various impurities which are present in it, and to deposit them in the tubules, down which they are washed into the pelvis of the kidney, and so by way of the ureter to the bladder. Anything which interferes with the working of these tubules will tend to diminish the quantity of urine that is passed.

1. *Acute Nephritis.*

ACUTE NEPHRITIS, or acute Bright's disease, as it is often called, after the physician who first fully described its symptoms, is a common complication of scarlet fever. It may also follow pregnancy, and is sometimes caused by wet and cold.

Symptoms.—An acute case begins with vomiting, pyrexia, œdema of the eyelids, and the passage of scanty and bloody urine. In milder forms of the disease albuminuria may be the first symptom. As the illness progresses, the œdema spreads all over the body, and the urine is reduced in quantity until sometimes only a few drachms are passed in the twenty-four hours. The presence of blood is shown by the brownish-red colour of the fluid.

These serious symptoms gradually pass off, and the patient is left with a trace of albumin in his urine, which at last completely disappears; or it may remain, showing that the kidneys have been permanently damaged.

On the other hand, the serious symptoms mentioned above may persist, until the patient ultimately falls into a condition of *uræmia*, or dies of some complication, such as pneumonia.

Nursing and Treatment.—The one object of treatment is to lessen the work of the kidneys as much as possible, since the tubules of those organs, being blocked by the products of inflammation, are for a time able to do but very little work.

Such a patient is therefore kept in a warm room and carefully shielded from draughts, clad in a flannel night-gown, and placed between blankets. The body should not be exposed when he is washed, which should be done with hot water, and the bed-pan should be thoroughly warmed before it is given to him. He is put on milk and farinaceous foods, the bowels are opened freely every day, and the skin is encouraged to act by means of drugs and the various forms of hot bath. This increased activity on the part of the skin and bowels tends to lessen the work of the kidneys, and so adds to the patient's chances of recovery. Imperial drink is given freely. After a fortnight or so, fish and eggs can be allowed in moderation. Dry cupping of the loins is sometimes ordered, as a mild form of counter-irritation, in cases which seem to be at a standstill. Iron is necessary in convalescence.

When *œdema* occurs in nephritis or in heart failure, the dropsy is to a considerable extent due to the kidneys excreting less than the normal amount of salts, which accumulate in the tissues. Since the salts must remain in solution, the tissues will draw water from the blood to dilute them, with the result that the tissue spaces become water-logged. A *salt-free diet* will greatly relieve this condition; no salt should be allowed the patient, and his butter, bread, vegetables, &c., should be prepared free of

it. The excess of salts will then gradually be withdrawn from the tissues, and the œdema will gradually disappear.

2. *Uræmia.*

URÆMIA indicates a state of profound blood-poisoning, due to the retention in the blood of waste substances which the kidneys, owing to their inflamed condition, are unable to remove. Its *onset* is frequently indicated by twitching of the face, drowsiness, persistent headache, and vomiting. Convulsive attacks set in, followed by coma which quickly proves fatal unless the patient is relieved by treatment.

Nursing and Treatment.—In cases where very little urine is being passed, and uræmia seems to be impending, pilocarpine is injected under the skin, it being a drug which induces profuse sweating; or the patient is placed in a hot-air or vapour bath. *Uræmic convulsions* are often treated by bleeding, the reason being that, since these symptoms are due to the irritating effect of the poison-laden blood upon the brain, by removing some blood we take away some poison. At the same time the bowels are very freely opened. Lumbar puncture is often helpful in arresting convulsions. The tongue should be protected by placing a piece of stick between the teeth. *Coma* is treated by bleeding and purgatives.

In the *prevention* of uræmia in acute nephritis, points to which the nurse should direct her attention are—to keep her patient warm and protected from the slightest chill, since anything which tends to check the action of the skin is bad for the kidneys; to see that the bowels are well open every day; to measure the urine, since a diminution in the quantity shows that the patient is losing ground; and to watch carefully for the first symptoms of uræmia even in mild cases.

The testing of urine, and the giving of hot-air and vapour baths have already been described.

3. *Chronic Nephritis.*

CHRONIC NEPHRITIS, or chronic Bright's disease, occurs in two forms :—

1. *The Large White Kidney*, which may develop gradually, or be a sequel of acute nephritis, occurring especially in children. Œdema is often considerable, and the urine is reduced in quantity and shows albumin or blood.

2. *The Red Granular Kidney*, which is rare before the age of forty years. This is often associated with overwork, over-eating, alcohol, gout, syphilis, and lead-poisoning. It begins insidiously with headache, breathlessness, or general weakness ; the urine is increased in quantity and of low specific gravity, with only a trace of albumin. The blood-pressure is increased ; headache, dyspepsia, and bronchitis are usual, and cerebral hæmorrhage not uncommon ; œdema is rare. With care the patient may last for many years, eventually dying of uræmia, cerebral hæmorrhage, pneumonia, &c.

Treatment.—Regular life ; moderate exercise ; free action of the bowels ; plenty of fluids to drink, but no alcohol ; light mixed diet, with meat and fish once daily. Cardiac symptoms and uræmia may be dealt with as already described.

4. *Calculus.*

(*a*) **Of the Kidney.**—Renal calculus is more frequent in males, and occurs usually after middle life ; it is specially common in certain districts—*e.g.*, Norfolk. The stone is usually composed of calcium oxalate, with a varying amount of calcium phosphate.

Acute renal colic occurs when a calculus tries to enter or move along a ureter. The pain is of sudden onset and of agonising character, commencing in the kidney region, and radiating down the ureter to the groin and testis ; micturition is frequent and bloody, and vomiting may occur. It

lasts one to many hours. The aim of treatment is to ease the pain—by morphine, hot poultices, hot baths, rest in bed, and hot drinks of lemonade. If the attacks recur, operation may be necessary.

(*b*) **Of the Bladder.**—A vesical calculus is generally composed of triple phosphate if it arises in the bladder, or of oxalate or uric acid if it has passed down the ureter. It gives rise to frequency of micturition, with pain just as the bladder is emptied localised to a point near the end of the penis; this is often most acute in children. There is generally slight hæmaturia. In women and children there may be interruption of the jet in micturition. The diagnosis can be confirmed by X-ray examination, by sounding, or by the use of the cystoscope. The treatment consists in crushing the stone, or removing it by lithotomy.

5. *Tuberculosis.*

(*a*) **Of the Kidney.**—The disease may be secondary to tuberculosis in the lungs or other organs, or may ascend from the bladder or epididymis. The symptoms are frequency of micturition, day and night, and a dull ache in the loin, with pyuria and sometimes hæmaturia. Tubercle bacilli may be found in the urine. It never heals, and operation is the only cure.

(*b*) **Of the Bladder.**—This is always secondary to tuberculosis of the kidneys or epididymis. The symptoms are frequency of micturition, especially at night, and pain in the bladder and at the end of the penis on micturition; the urine may be clear or purulent, and blood is not common. The prognosis is grave; operations and drugs are useless.

(*c*) **Of the Epididymis.**—This is not uncommon, and may occur in infants. The epididymis becomes thickened, hard, and irregular. A small hydrocele may develop, and sometimes a cold abscess. Change to the country or seaside is essential, and heliotherapy is useful. If the disease extends, operation may become advisable.

6. *Pyelitis.*

PYELITIS, or inflammation of the pelvis of the kidney, may complicate pre-existing disease of the urinary tract, or may develop in a urinary tract free from disease. In the latter case, the source of infection lies usually in the bowel (*e.g.*, chronic constipation, appendicitis, piles) or gall-bladder. Pyelitis is of special importance in pregnant women and infants, in whom it is almost confined to the female sex. It is most commonly due to the *bacillus coli communis*, which is found in the urine (*bacilluria*).

Acute pyelitis has a sudden onset, with a remittent temperature rising to 103° F. or higher, sometimes with rigors; drowsiness or delirium may occur, suggestive of brain trouble; restlessness is constant. There may be tenderness over the kidneys; the urine is acid, with some pus-cells and albumin. *Treatment* consists in rendering the urine neutral by the administration of *alkaline* remedies (sodium bicarbonate, citrate, or acetate of potassium) and keeping it so, thus neutralising the acid toxin. Diuretic waters and purgatives are also required. Sometimes, instead of this alkaline treatment, *antiseptic* treatment is used in an attempt to destroy the bacteria. The most powerful antiseptic for the purpose is urotropine, which requires for its action that the urine should be acid. To make neutral or alkaline urine acid, sodium acid-phosphate is given after food. Urotropine should be given in a large draught of water when the stomach is empty, so as to avoid the acid of the gastric juice. The *diet* should be mainly fluid, but Benger's food or milk-pudding may be allowed, also tea.

Chronic pyelitis has symptoms resembling those of chronic cystitis. Either the antiseptic or the alkaline treatment may be tried. Benefit often results from the use of an autogenous vaccine. The treatment required is likely to be a prolonged one. The primary source of infection, of course, also requires attention.

7. *Cystitis.*

This condition is described on p. 650.

B. The Skin.

Symptoms of Skin Affection.—There may be *anomalies of sensation*, such as itching (pruritus), and much less commonly pain or anæsthesia; *anomalies of secretion—e.g., seborrhœa* (an excessive secretion of sebum by the sebaceous glands with an alteration in its composition) and *hyperidrosis* (excessive sweat); *anomalies of circulation*, as in urticaria and purpura; *inflammation*, as in eczema, psoriasis, ringworm, scabies, &c.

A *macule* is a discoloration of the skin without appreciable elevation of the surface.

Erythema is redness of the skin due to hyperæmia; it disappears on pressure.

A *petechia* is a point-like hæmorrhage into the skin; it is not altered by pressure. An *ecchymosis*, or bruise, is a larger hæmorrhage into the skin. *Purpura* is a condition of purple blotches of hæmorrhage under the skin.

A *papule*, or pimple, is a small solid elevation of the skin. Generally it passes into a vesicle, a pustule, or a scale, or it may break down into an ulcer. It is usually attended by itching. Its colour is coppery in syphilis, pink in urticaria, bright-red in eczema.

A *vesicle*, or small blister, is an elevation of the epidermis containing serous fluid. It is usually round, but may be oblong in scabies, and umbilicated in smallpox. Vesicles are found in closely-set clusters in herpes and eczema; in chickenpox they are usually discrete.

Bulla, or bleb, is the name given to a blister larger than a pea.

A *pustule* resembles a vesicle, except that the fluid it contains is purulent. Most frequently it develops from a vesicle.

A *scale* is a dry and usually laminated exfoliation of the

epidermis. It is large and thin in pityriasis rubra, silvery in psoriasis, dull in seborrhœa, crusted in eczema.

A *scab*, or crust, consists of dried-up exudation mingled with epithelial débris.

Pigmentation is an abnormality of the natural coloration of the skin ; it is a common sequela of skin eruptions.

Treatment.—The drugs most frequently employed internally are arsenic, mercury, iodide of potassium, iron, thyroid extract, and purgatives.

Much more important usually is the local treatment. Before commencing the treatment of any skin disease, it is first of all necessary to *remove from the surface any crusts, scales, &c.*, which, lying on the surface, prevent an application from reaching the actual disease. There are various methods of doing this. The part may be covered with strips of lint, soaked in olive-oil. On the scalp, common paraffin-oil, in virtue of its penetrating power, is of great value in removing accumulated scales.

One of the best methods is the prolonged application of *boracic starch poultice*, which is made as follows : one teaspoonful of boric acid is mixed with four tablespoonsful of cold water starch, and enough cold water to give the mixture the consistency of cream ; a pint of boiling water is then gradually added, the mixture being constantly stirred until the starch bursts and a translucent jelly is formed. When cold, it is spread on cloth in a layer half an inch thick, covered with muslin, and applied to the part four times a day. Enough of the starch jelly may be made to last for two or three days. In addition to its power of removing scales and crusts, this poultice is a valuable soothing application in inflammatory cases.

Ointments.—Far too much local treatment consists in the mere perfunctory application of zinc ointment. It is sometimes even harmful. Fat is greedily taken up by the cells of the skin and causes them to swell, damming back the natural evaporation. This is especially undesirable in sunburn, for which cooling lotions should be used, not ointments. *Ointments proper* contain small proportions of

drugs mixed with one or other of the fats—*e.g.*, vaseline, lanoline, benzoated mutton tallow, which serves to carry the drug in. *Cold creams*, or evaporating ointments, contain water which by evaporating gives rise to a cooling sensation. *Pastes* are combinations of fat with a considerable proportion of powder; their penetration is less than that of ointments, but the powder contained soaks up the exudation instead of damming it back as ointments tend to do. *Lassar's paste*, consisting of equal quantities of zinc oxide, starch powder, lanolin, and vaseline, is the most familiar.

Powders.—These protect the skin from external irritation, and soak up any excreted fluid; they are therefore beneficial to erythematous skin. Those commonly used are zinc oxide, starch, talc, boric acid, kaolin, and violet powder.

Lotions.—These are chiefly used to allay itching and irritation—*e.g.*, carbolic lotion, calamine lotion, and evaporating lotions.

Glyco-gelatin or *Unna's paste.*—This is often employed in the dermatitis which accompanies varicose veins of the legs. It is a mixture of zinc oxide, gelatin, glycerine, and water, to which drugs such as ichthyol or sulphur may be added. It is melted in a glue-pot, and painted on the affected surface; when nearly dry, it is daubed with absorbent wool to form a more durable film, and bandaged.

1. *Eczema.*

ECZEMA is a catarrhal inflammation of the skin (*dermatitis*), arising in those constitutionally subject to it. It may be acute or chronic, and is characterised by a variety of lesions—*i.e.*, erythema, papules, vesicles, pustules, scales, and crusts. It is associated with itching, and more or less discharge or weeping. A similar condition is often produced by external irritation, such as a bad soap or hair dye, an irritating chemical, or exposure to weather; by some physicians this is also included in the term eczema.

Eczema commonly attacks the soft parts of the skin, such as the flexures of the elbows and knees, but it may be found on the face and scalp, and indeed any part. When it occurs in folds of the skin, it is called **Intertrigo**; the folds must be kept scrupulously clean, and separated by dusting powder or ointment spread on lint.

The **Treatment** of eczema is often difficult, but success will depend chiefly on the way in which it is carried out. Ointments must always be applied most gently to an eczematous surface; they should be spread on lint and lightly bandaged on. In this way exposure to the air is minimised, and so drying of the secretion into scabs avoided. The dressing should be changed at least twice a day, the ointment and discharge being gently cleaned off before the fresh dressing is applied. It is often useful to lay on the face of the ointment a single thickness of butter-muslin.

If the eczema is in the early erythematous stage, a dusting powder or calamine lotion is often sufficient. If it is of the weeping variety, soothing lotions are used, such as dilute liquor carbonis detergens, lead and spirit, or lead and carbolic, applied on gauze or lint. The surrounding healthy skin should be protected from inoculation by smearing it with zinc ointment. The dressing should be changed frequently and never be allowed to get dry; if necessary, oiled silk may be used to keep in the moisture. When secretion has stopped calamine lotion is useful, and a mild mercurial ointment is often applied during convalescence. The patient must be advised to avoid soap and water, and to use a little olive-oil or vaseline to clean the skin. (For *diet*, see p. 60.)

2. *Impetigo Contagiosa.*

IMPETIGO CONTAGIOSA is much more common in children than in adults. It is not only contagious from one person to another, but can be conveyed by the finger-nails from one part of the body to another. It is especially prevalent in crowded dwellings, and is a common complica-

tion of scabies and pediculosis. The microbe concerned is probably the ordinary staphylococcus. First, small erythematous spots appear, on which vesicles develop which soon become pustular and form yellowish scabs; these have the peculiarity that there is no halo of hyperæmia around them. The raw surface left by removing the scabs secretes a thick honey-like discharge, which dries and forms more scabs. The neighbouring glands often become enlarged.

The **Treatment** consists in removing the scabs by soaking with carbolised oil or boric starch poultices, and applying a weak mercurial ointment, such as white precipitate ointment. The neighbouring parts should be washed with carbolic lotion, and scratching prevented.

3. *Psoriasis.*

PSORIASIS is an affection of the skin characterised by flat dry patches of varying extent, covered with white or silver-grey scales; there is no exudation, and therefore there are no crusts. The patches are commonly on the extensor surfaces of knees and elbows, and on the scalp, but they may appear anywhere. There is usually little itching, and it does not affect the general health. It begins usually in childhood, and tends to relapse in spring and autumn. It is treated by arsenic internally, and the application of ointments of chrysarobin, oil of cade, &c., locally. In using chrysarobin ointment, care should be taken to limit the application strictly to the patches, to avoid the eyes, and to provide old nightgowns, pillow-cases, and sheets, as irremovable staining of these articles is produced.

4. *Ringworm.*

RINGWORM is due to the growth of a vegetable fungus or mould. On the scalp it does not often form a ring, so the name is somewhat misleading. Under the microscope

the mould is seen to consist of two parts, little threads (mycelium), and round bodies (spores). There are two kinds of ringworm, distinguished by the size and arrangement of their spores; one is known as the small-spored, and the other as the large-spored ringworm. Ringworm of scalp (*tinea tonsurans*) rarely occurs in children over twelve years of age.

The **Small-Spored Ringworm** is by far the more usual. The fungus affects the scalp, producing scaly areas, and rapidly invades the hairs, causing them to break off quite short. If a child has a scaly patch on the scalp, therefore, this should be carefully examined with a lens; if any short "stumps" of hairs are found in it, it is almost certainly a case of ringworm.

When **Large-Spored Ringworm** attacks the scalp, it also produces scaly areas and causes the hairs to break off. But the broken hairs are not very short, and are scattered among hairs which are apparently normal, so that generally the patch is not bare, as it often is in the other form of ringworm. This, of course, makes it all the easier for the nurse to overlook the fact that the child has ringworm. The large-spored fungus may also attack the skin of the body, producing red scaly spreading rings (*tinea circinata*).

Treatment.—Ringworm of the *skin* is readily cured by painting the patch with tincture of iodine once daily for three days. Ringworm invading the *hair*, on the other hand, is most difficult to cure, apart from the complete removal of the hair by exposure to X-rays (see p. 631).

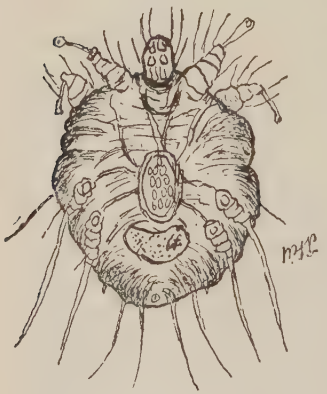
If a child is suspected of having ringworm, the scalp should be completely enveloped in a bonnet made of old linen, to limit the possibility of spores blowing about and infecting other children. The hair should not be cut or the patch painted with iodine until the doctor has completed his examination of suspected hairs. Brush, comb, and hat should be destroyed. In hospital, articles of clothing and bedding not boiled in the laundry should be

baked before washing. The patient must not mix with other children until cured.

FAVUS, which is also due to a special fungus, is rare in England, but may be briefly described here, as it occurs in Scotland and also on the Continent. It can be transmitted by contact or through the medium of clothes or headgear. It affects especially the scalp, where it first appears as a tiny yellow-cupped disc, pierced by a hair; later a large rugged scab forms, and this after some months comes away, leaving a glistening bald pit. It is difficult to cure, and may persist for years. The crusts should be soaked off, the hairs removed by X-rays, and finally parasiticides vigorously rubbed in.

5. *Scabies.*

SCABIES, or itch, is caused by a small parasite, the *acarus*, the female of which burrows under the skin and there deposits her eggs. This gives rise to itching, leading to scratching, which often causes vesicles, pustules, and scabs to form. The lesions are most abundant in the parts of the skin which are least thick—viz., between the fingers, around the wrists, the bends of the elbows, inside the umbilicus, the genitals, and the ankles. A burrow is from $\frac{1}{8}$ to $\frac{1}{2}$ in. long usually, and is indicated in some cases by a little vesicle at the entrance — in others by a rough line, marking a track blackened by the excrement the acarus leaves behind her.



The Acarus of Scabies.

Treatment aims at breaking up the burrows, killing the parasites, relieving the itching, and curing the secondary lesions. The affected parts should be soaked in hot water in a bath, and vigorously scrubbed with soft soap to lay open the burrows. Diluted sulphur ointment should then be thoroughly rubbed in and plastered over the affected parts. Young children should have their hands enveloped after the ointment has been applied. This process should be repeated night and morning for three days, the patient using old undergarments and sheets. It is useful to scatter sulphur powder in the bed. The patient's clothes should be disinfected by boiling or fumigation. Calamine lotion, boric ointment, &c., may be used to heal the sores after the sulphur treatment is completed

CHAPTER XIX.

DISEASES OF THE NERVOUS SYSTEM.

A. *Motor Symptoms.*

THE principal are paralysis, spasm, and inco-ordination. Convulsions and rigidity are varieties of spasm.

1. **Paralysis** is loss of power in the muscles, generally due to lesions of the nervous system. It may also occur in diseases of the muscular substance itself, such as pseudo-hypertrophic paralysis. It should be distinguished, however, from the weakness which arises from defective nutrition, such as follows prolonged illness. Names have been given to special forms of paralysis; thus, partial paralysis of one side of the body is *hemiplegia;* paralysis of the legs, or the legs and trunk, *paraplegia;* and paralysis of one limb, *monoplegia.*

2. A **Spasm** is an involuntary contraction of a muscle. It may be due to (*a*) a lesion of the spinal cord, cutting off the inhibitory impulses normally received by the spinal nerve-cells from the brain, as in spastic paraplegia; or (*b*) a part of the motor nervous system being over-sensitive, as in epilepsy. The term *cramp* is generally used to designate spasm accompanied by pain. Spasm may be either tonic or clonic:—

(*a*) A *Tonic Spasm* is one which is continuous while it lasts. It occurs in certain diseases of the brain and spinal cord; it is also present in tetanus, strychnine poisoning, hysteria, and catalepsy; and it occurs in the first stage

of an epileptic fit. If the whole body takes part in the convulsion, as it does in epilepsy, all the muscles of the limbs and trunk are stiff and rigid, the head is drawn backwards, and there may be arching of the spine so that the feet and the head are the only parts in contact with the bed (*opisthotonus*).

In certain nervous diseases (cerebral diplegia, spastic paraplegia) there is a permanent condition of spasm of the muscles, producing *rigidity* and a spastic gait.

(*b*) *Clonic Convulsions* occur during the second stage of epilepsy, in uræmia, brain disease, hysteria, catalepsy, and other conditions. There is a rapidly alternating contraction and relaxation of opposing muscles, as, for example, flexion and extension of the forearm.

Convulsions caused by tetanus, uræmia, and strychnine poisoning are a symptom of grave significance, while those which have their origin in hysteria or catalepsy are not an occasion for anxiety. Similarly, the convulsions of childhood can be taken less seriously than those of adult life ; the excitable nervous system of a growing child is easily thrown off its balance, and easily recovers. Rickets is the most important predisposing factor in these young cases.

The nurse should note the following points to enable the practitioner, who arrives later, to determine the cause :—

(*a*) Did any warning symptoms precede the fit ?

(*b*) Were the convulsions local or general, and did they commence in any particular group of muscles ?

(*c*) Were they tonic or clonic, or did one kind succeed the other ?

(*d*) Were they accompanied by loss of consciousness ?

(*e*) How long did the fit last ?

(*f*) Was the face pale or cyanosed ?

(*g*) Were the eyes open or closed ?

(*h*) Did the bowels or the bladder act involuntarily ?

3. **Inco-ordination** or **Ataxia.**—Muscular movements obviously require the most exact adaptation in the contractions of the different muscles concerned. These are not only the muscles needed to effect the movement, but

also their antagonists—*e.g.*, the extensors must relax while the flexors are acting. If this adaptation is imperfect, the movement becomes irregular or disorderly, and *inco-ordination*, or *ataxia*, results. Thus, in certain diseases—*e.g.*, locomotor ataxy, the patient cannot walk in a straight line, and is unable to touch his nose with his eyes shut.

4. **Contracture.**—In cases where a group of muscles is weakened or paralysed for a long period, its antagonists are apt to become permanently shortened as a result of their unopposed action. This is often seen in infantile paralysis when precautions against it by splintage have not been taken, and paralytic club-foot is a not infrequent consequence.

5. **Gaits.**—(1) *The Spastic Gait* is found in lesions such as disseminated sclerosis, spastic paraplegia, and cerebral diplegia. When the patient walks, he drags the leg slowly forward with the toes scraping the ground ; the knee and ankle are kept slightly flexed, and there is often so much adductor spasm that the feet may cross each other. The *knee-jerk* (the reflex extensor movement produced by tapping below the patella) is exaggerated. *Ankle-clonus* (an involuntary alternate contraction and relaxation of the calf muscles, when put slightly on the stretch) is often present.

(2) The *Ataxic Gait* occurs in locomotor ataxia. The patient walks with his feet apart, his heels are brought down in a stamping manner, and the foot is flung forward at each step. He watches his feet, and relies largely on his sight to maintain a straight line. He cannot stand with his eyes shut. The knee-jerk is absent.

B. *Sensory Symptoms.*

1. **Anæsthesia** is loss of tactile sensibility. It can be investigated by lightly touching the surface of the skin with a strip of paper while the patient's eyes are closed ; he should be able to say when and where he is touched.

2. **Analgesia** means insensibility to pain. It occurs

in syringomyelia, tabes, and other diseases. It may be tested by pinching or pricking with a blunt point. Excessive sensibility to painful impressions, or the production of pain by impressions commonly painless, is called **hyperalgesia.**

3. **Loss of Sensibility to Temperature** may be ascertained by the application of test-tubes holding hot and cold water; it is a symptom which occurs in syringomyelia and certain other diseases.

4. **Muscular Sensibility** is examined by asking the patient to distinguish between different weights placed in his hand.

C. *Incontinence.*

1. **Of Urine.**—In infancy, the bladder empties by reflex action; when a certain quantity of urine has accumulated, it is ejected. Later, the child learns to control the bladder by cerebral action.

If the spinal cord is injured above the level from which the nerves to the bladder are derived, retention of urine and distension of the bladder occur. If not relieved by catheterisation, the bladder distends till the pressure within it overcomes the resistance of the sphincter, and then *overflow incontinence* results. This stage may last one or two months. Later, when the spinal shock has passed away, *reflex incontinence*, similar to that of the infant, may develop—*i.e.*, the bladder empties every few hours without the patient's volition. This generally becomes a permanent condition. In other cases there may be a *simple incontinence*, the urine dribbling away from a bladder which does not become over-distended, though it is rarely empty.

Until reflex incontinence is established, close observation is necessary to ensure that the paralysed bladder does not get over-distended. In some cases it is possible to express the urine several times a day by pressure above the pubes; in others it is necessary to tie a Jacques catheter in, washing the bladder out twice daily. Sepsis

is a great danger; the catheter should, of course, be sterile, and urotropine given to keep the urine clean.

2. **Of Fæces.**—Incontinence of fæces may occur in injuries to the spinal cord from the rectum being cut off from cerebral control. In some cases there is a certain amount of control, and only liquid stools and flatus escape involuntarily. In others neither firm or liquid stools can be retained in the rectum. An attempt should be made to render the stools solid to prevent their continuous evacuation; a constipating diet may be given, and the bowel emptied each morning by enema. The neighbourhood of the anus is apt to become excoriated, and should be washed frequently and covered with ointment.

D. *Coma.*

Patients are not infrequently brought to hospital in a state of unconsciousness or coma, and it may therefore be well to enumerate here the conditions to which this may be due. Apart from mere fainting or *syncope*, which is usually rapidly recovered from, the principal causes of unconsciousness are [1]:—

Apoplexy.—See p. 307.

Epilepsy.—See p. 315.

Injury.—Concussion, or fracture of the skull, see p. 235.

Opium, or other poison, see p. 211.

Urinary abnormality.—Uræmia, or diabetic or hypoglycæmic coma, see pp. 288, 335, and 337, respectively.

Whisky, or other form of alcohol, see p. 236.

Hysteria.—See p. 319.

Any one found unconscious should be placed on his side rather than on his back. The objections to the latter position are twofold. In the first place, the tongue is liable to fall backwards, and so obstruct the entrance of air into the lungs. Secondly, the patient may unexpectedly vomit,

[1] The initial letters of these causes form a mnemonic, since they consist of the vowels a, e, i, o, u, w and y (the last letter standing for hysteria).

when, if he is lying on his back, there is a risk of food getting into the larynx.

Even if he is lying on his side, the mouth should be cleaned out after the act of vomiting, so that nothing may be left in it which could be drawn into the air-passages. The clothing should be loosened so that respiration may be rendered as easy as possible, and cold water be sprinkled on the face. Stimulants should never be given to an unconscious patient, for if the case is one of cerebral apoplexy, or intoxication, nothing but harm can result from their administration.

I. Diseases of the Meninges.

Meningitis.

The membranes which surround and support the brain and spinal cord are called the "meninges." When they are inflamed, the patient is said to have meningitis. This may be either (*a*) *suppurative*, in which case it is most often due to inflammation of the middle ear, the infection spreading through the bone into the interior of the skull; or (*b*) it may be *tuberculous*, and therefore caused by the tubercle bacillus; or (*c*) it may be due to a special variety of coccus, in which case it is called *epidemic cerebro-spinal* meningitis (see p. 437), since it is a form that spreads, especially among children. Several hundred cases occurred during an outbreak of the last-mentioned disease in Glasgow some years ago. Of the three forms of meningitis the tuberculous is by far the most common.

Symptoms.—These are more marked and more rapidly fatal in the suppurative form. In all there may be constant vomiting, severe and persistent pain in the head, intolerance of light and noise, a frequent sharp cry, convulsions, squinting, and retraction of the head so that it is bent backwards upon the neck. All these symptoms

are due to the irritated condition of the brain and nerves set up by the inflammation of the membranes.

Nursing and Treatment.—This is a very fatal disease in both the suppurative and tuberculous varieties, though a few cases of the former are cured by operation. In the cerebro-spinal form the outlook is more promising, though the mortality is always very high. The patient, usually a child, must be kept in a darkened room and carefully protected from light and noise. An ice-cap is applied to the head, which should be supported whenever the child is raised, and the bowels kept open by aperients. Towards the end of the illness, when the child has fallen into a comatose condition, it is apt to lie with its eyes open, so that the eyeballs become dry and dust collects on them. To remedy this, and prevent them becoming inflamed, the nurse should bathe them systematically with boracic lotion, and, if necessary, keep the lids closed with a bandage and pads of lint. *Food* will consist of milk and beef-tea, which in the later stages of the illness may have to be given through a nasal tube, or, if vomiting is very persistent, in the form of an enema.

II. Syphilis of the Central Nervous System.

1. *Locomotor Ataxy.*

LOCOMOTOR ATAXIA, or *Tabes Dorsalis*, is an affection following syphilis, and characterised by pain ("lightning pains," usually in the legs, "girdle pain," and epigastric pain, called "gastric crises"), absence of knee-jerks, ataxic gait and inco-ordination of movements, eye symptoms, and difficulty in micturition. It is much more common in men, and the usual age is 25 to 45 years. Recovery never occurs, but the duration is usually from ten to fifteen years.

2. *General Paralysis of the Insane.*

GENERAL PARALYSIS is a degeneration of the cerebral cortex due to syphilis. It has a similar age and sex incidence to tabes. The early symptoms are psychical—*e.g.*, inattention to business affairs, outbursts of temper, excesses, and senseless expenditure. Later there develop delusions of grandeur, followed by progressive dementia and paralysis, often with epileptiform attacks. The appearance is often characteristic; the face shows complacent stolidity, the speech is slow and slurred, and the lips and tongue are tremulous, as also is the writing. The disease advances until the patient is paralytic, demented, incontinent, and bedridden; death takes place in from two to five years.

III. Diseases of the Brain.

1. *Apoplexy and Hemiplegia.*

HEMIPLEGIA means "a half stroke"—that is to say, one-half of the body is paralysed. It is most commonly caused by the bursting of an artery within the brain, *Apoplexy*. When this happens, the blood that is poured out tears up the delicate nerve fibres which are running from the cells on the surface of the brain to the muscles of the face, trunk, and limbs. Now, the nerve fibres which pass downwards through each half of the brain cross at its lower part, just before they enter the spinal cord, so that the nerve fibres which come from the cells in the cortex of the left half of the cerebrum, run downwards in the right half of the spinal cord, and therefore supply with nerves the muscles on the right side of the body. Consequently, if the hæmorrhage takes place in the left half of the cerebrum, the right half of the body is paralysed, and *vice versa*.

This accident is most likely to happen in people over forty years of age, especially those who are suffering from

chronic inflammation of the kidneys; for, as a result of that disease, the arteries become brittle and the heart becomes enlarged and beats more strongly, therefore putting a greater strain than normal on the weakened vessels.

Sometimes a stroke is due to *Cerebral Embolism* or to *Thrombosis*. The embolus has its origin usually from the heart—*e.g.*, a piece of clot from a diseased valve. Thrombosis results from arterial degeneration.

Symptoms.—The onset of unconsciousness may be sudden, or it may be gradual, finally deepening into complete coma, which is accompanied by loud snoring breathing, and puffing out of one or both cheeks on expiration. The patient is now found to have lost the use of his arm and leg on one side of the body. When lifted, they fall in a limp and helpless way. The face is also paralysed on the same side, and in a lesser degree the muscles of the chest and abdomen. When the hæmorrhage occurs in the left half of the brain, the power of speech is impaired or lost (*Aphasia*).

Nursing and Treatment are at first directed towards doing everything to check further bleeding from the ruptured artery. The patient is kept quite still, with the head and shoulders slightly raised, and an ice-bag may be applied to the scalp. A brisk purge is usually given at once, a few grains of calomel being shaken on the back of the tongue; or a drop of croton-oil is mixed with a teaspoonful of milk, which is then carefully placed on the back of the pharynx, the head meanwhile being held on one side; or an enema of turpentine or castor-oil is administered. A purge is useful, because it temporarily diminishes the amount of blood in the vessels of the brain. Stimulants should on no account be given. Should the patient remain comatose, the urine may have to be drawn off with a catheter. If the respiration is impeded by the tongue falling backwards upon the opening of the larynx, the head must be placed on one side and kept in that position. Venesection is sometimes done.

It is important that a bed-sore should be prevented; a

water-bed may be needed. The patient must not be allowed to remain constantly on his back, but turned occasionally from one side to the other, and propped in that position with pillows to prevent pneumonia. Food, which will consist only of liquids, should be administered by nasal tube or enema, as long as he is unconscious. If given by the mouth, there is the risk of some of it getting into the air-passages and setting up pneumonia.

Later, massage and movements, passive and active, are needed, and splints have to be worn at night to prevent deformity.

2. *Intracranial Tumours.*

INTRACRANIAL TUMOURS are commonly tuberculous in childhood, syphilitic or gliomatous in adults. They cause symptoms of intracranial pressure (headache, vomiting, optic neuritis, and mental changes), as well as certain localising symptoms depending on the part affected.

3. *Abscess.*

CEREBRAL ABSCESS is usually secondary to chronic middle ear disease; it similarly gives rise to symptoms of intracranial pressure. Operation for drainage is performed at the earliest possible moment.

4. *Cerebral Diplegia.*

CEREBRAL DIPLEGIA, also called *Spastic Paralysis of Infants*, or *Little's Disease*, is generally due to injury of the brain at birth, but sometimes is the result of its defective development. The symptoms are paralysis and rigidity, affecting the legs much more than the arms; the spasm of the adductor muscles of the thighs often produces the exaggerated form of spastic gait known as "scissors gait." There is always some degree of mental defect, and epileptic convulsions may occur. Tenotomy to correct contractures, and division of nerves to reduce spasm, are the operative

measures usually adopted. Long and careful education afterwards in the use of the affected muscles is required to reap full benefit from the operation.

5. *Hydrocephalus.*

HYDROCEPHALUS is usually present at birth, or commences soon afterwards; spina bifida may co-exist. The sutures of the skull fail to unite, and the circumference of the cranium is greatly increased, sometimes to 30 inches or more, making it disproportionate to the size of the face. The ventricles are distended with clear fluid, even as much as 15 pints, and the convolutions are flattened out. There is usually a general arrest of the development of the body, with mental deficiency, and sometimes convulsions and blindness. Death often occurs within three or four years. No treatment has proved of any use.

IV. Diseases of the Spinal Cord.

1. *Acute Poliomyelitis.*

ACUTE POLIOMYELITIS, or *Infantile Paralysis*, is an infection of the central nervous system. It occurs in the form of sporadic cases or of small epidemics, and is now the most important cause of crippling in London. Both sexes are equally affected, and in the great majority of patients the onset occurs under the age of three, although adults are not immune. The virus is stated by Flexner to be a filter-passer; infection is believed to occur through the nasal mucosa, spreading to the central nervous system *viâ* the lymphatics of the olfactory nerves. During the acute stage, there is an inflammation of parts of the spinal cord, which involves destruction of a certain number of cells from which the muscles of the limbs, &c., are innervated. The disease may be of any degree of severity, involving one or many muscles, and in each muscle destroy-

ing either certain fibres of the muscle or the entire muscle. In severe cases the whole limb, or limbs, may be completely paralysed; in slight cases there may be simply a loss of balance between muscles, so that those which remain strong overcome their weakened opponents and give rise to contractures.

Symptoms.—The *onset* is sudden. For a few days the child has fever, malaise, vomiting, and sometimes diarrhœa or convulsions, and is then found to be paralysed in part or all of one or more limbs. The paralysis is most common in the leg, the dorsiflexors of the ankle being most frequently affected. Pain may be absent, but may be severe. The cutaneous sensations are normal. The initial stage lasts two or three weeks, and by this time the paralysis is often already greatly improved. *Death* is usually due to respiratory paralysis or broncho-pneumonia. The *stage of recovery* may continue for upwards of two years. As the child grows, *permanent results* become obvious: (1) the affected limb is cold and wasted; and also short, for a bone does not grow normally if many of its attached muscles are paralysed; (2) deformities appear, especially talipes and flexion of the hip and knee, due mainly to the unopposed action and contracture of the antagonistic muscles.

Treatment.—When the disease is recognised in an early stage, the first essential is complete rest, the child being fixed in a wool-lined plaster bed or splint. Aspirin or morphine may be needed for pain. Hexamine is sometimes given.

After this preliminary rest, which should last for six weeks or so, the treatment consists in—

(*a*) The application of splints to prevent contracture of muscles and production of deformities. The paralysed muscles must be kept in a position of relaxation, and never be allowed to be stretched. Stretching may result from gravity (drop-foot), or from over-action of unopposed muscles, or from the limb lying in a wrong position.

(*b*) Electrical stimulation of the muscles, and graduated exercises designed to restore power to the muscles weak-

ened by the attack. In carrying out this treatment, it is essential that the right muscles should be treated.

(*c*) The application of such surgical appliances as are required to restore to the damaged limb its proper functional use, and to prevent deformities arising either from the weight of the body, or the pull of muscles relatively too strong (see p. 596).

Eventually surgical measures may be required to correct deformity (by wrenching or tenotomy); to restore the proper balance of power between the muscles acting on a joint (by transplantation of tendons); or, when the muscular loss is great and the joint is flail, to stabilise the joint (by arthrodesis).

Prevention.—The disease is spread by *carriers*. Contacts, therefore, should gargle their throats with a 1 in 4000 solution of potassium permanganate, which appears to be specially lethal to the micro-organism.

2. *Spastic Paraplegia.*

SPASTIC PARAPLEGIA is due to degeneration of the upper motor neuron. Although there is absence of wasting, there is marked loss of power and rigidity in the muscles of the legs, with the result that the gait is spastic.

A common form is **Compression Myelitis,** generally due to tuberculous caries or fracture-dislocation of the spine. In this there are, in addition to the symptoms of spastic paralysis, some local pain and tenderness with rigidity and deformity of the spine. There may also be anæsthesia, and the sphincters may be affected.

The **Treatment** is absolute rest, with hyperextension and various mechanical appliances. Laminectomy or spinal bone-grafting is sometimes performed.

The condition of the bladder and rectum varies with the seat of disease. There may be incontinence of both urine and fæces, or there may be constipation with retention of urine which dribbles away from the over-full bladder.

Bed-sores and inflammation of the bladder are the two complications which the nurse must do her utmost to prevent. To guard against the former, a water-bed, scrupulous cleanliness, and, when possible, change of posture, are essential. Great care should be taken in the use of hot-water bottles, as in these cases a burn may be very easily produced without the patient knowing it.

Of equal importance is the prevention of cystitis, to which these patients are only too liable. Careful sterilisation of catheters, and, in the case of females, thorough cleansing of the external genitals before an instrument is passed, must be constantly practised. The nurse must remember that, owing to the loss of sensation in the lower half of the body, the patient may feel no desire to empty his bladder or rectum, and may have no knowledge when he has done so. When there is incontinence, the medical attendant will expect the nurse to be able to tell him whether there has been a constant dribbling of urine from an over-full bladder, or whether it has been passed in any quantity. It is this constant condition of uncleanliness, together with the difficulty of moving the patient, that makes cases of paraplegia so trying and tiring to nurse; for, no matter how frequently they soil the bed, they must be just as thoroughly and carefully cleansed as if it happened only once in the twenty-four hours.

3. *Disseminated Sclerosis.*

DISSEMINATED SCLEROSIS is not uncommon. It presents the symptoms of spastic paraplegia, and, in addition, *nystagmus* (oscillation of the eyeballs), "intention" tremor (tremor on exertion), and "scanning" speech (syllables pronounced separately and staccato). Massage, passive movements, and the administration of arsenic form the treatment usually adopted; the disease is incurable, but may run a long course.

V. Diseases of the Peripheral Nerves.

Peripheral Neuritis.

In this disease the nerves which supply the muscles of the limbs are inflamed, so that a patient suffers from a more or less complete paralysis of the extremities. Lead-poisoning, alcohol, diphtheria, arsenic, and influenza are the most common causes.

Symptoms.—In some cases all four limbs are affected, in others only one or two, or the weakness may be restricted to a few of the muscles. "Wrist-drop," generally due to lead-poisoning or the improper use of crutches, is seen when the patient holds his hands out in front of him; they hang helplessly downwards, and cannot be extended backward, owing to the paralysis of the extensor muscles.

Nursing and Treatment.—Complete rest, with a water-bed for bad cases, and a nourishing diet. If the illness has been caused by a poison, such as lead or alcohol, the further entry into the system of the poison must be at once prevented. Nursing must be conducted on the same lines, and with the same care, as in other forms of paralysis. Electricity and massage are frequently of great value during convalescence.

VI. Functional Disorders.

Meningitis, hemiplegia, paraplegia, and peripheral neuritis are all examples of disease. When the body is examined after death, certain changes from the normal are at once obvious in that part of the nervous system which is affected.

Epilepsy, chorea, and hysteria, on the other hand, are not caused by changes in the structure of the brain, but are due to alterations in its working. Its functions are disordered, but no actual disease of its substance has up to the present been detected.

1. *Epilepsy.*

There are two forms of epilepsy—the "minor," in which there is merely loss of consciousness, lasting for one or two seconds; and the "major," in which the loss of consciousness is much more prolonged, and is accompanied by convulsions. The latter form alone will be described. Fright, worry, head injuries, and mental disease in the parents are among the many causes of epilepsy.

Symptoms.—About half the patients have what is called an "aura," or warning, immediately before the fit. One has a feeling of numbness or tingling in a limb, another an unpleasant smell or taste, a third a sensation of choking or nausea, and so on. In each case the patient knows that he is going to have a fit.

Immediately after the aura he falls into a state of unconsciousness, sometimes with an involuntary cry. For about half a minute the body remains stiff and rigid; then general convulsive jerkings of all the muscles follow, beginning with twitchings in the eyelids and face. During this stage, which lasts about three or four minutes, there is frothing at the mouth, the tongue is often bitten, the face becomes livid, and urine and fæces may be passed involuntarily. After a time the convulsions gradually cease, and the condition of unconsciousness passes into one of heavy sleep.

Nursing and Treatment.—In some cases a fit can be prevented. When there is a definite aura in a limb, rubbing the extremity, or firmly grasping it above the seat of the sensation, will sometimes stop the aura and prevent the fit. If there is time, the patient should be laid on his back, his clothes loosened about his neck, and any false teeth removed. When possible, a gag of some sort, such as a handkerchief wrapped round the handle of a spoon, should be placed between the teeth to save the tongue from being bitten. No attempt should be made to restrain his movements during an attack, unless there is a risk of the patient injuring himself. When the fit is over, he should

not be roused, but allowed to sleep. Should he vomit while unconscious, his head must be held on one side to prevent the contents of his stomach being drawn into the air-passages.

Points which a nurse should take special note of are the mode of onset, whether sudden or gradual, the part in which convulsions begin, and whether consciousness is lost. Epilepsy may occur during sleep. An epileptic person should never take a bath by himself, lest drowning result from a fit occurring while in the water.

2. *Infantile Convulsions.*

INFANTILE CONVULSIONS are convulsions resembling epilepsy, but not recurring if the cause is removed. If they are recurrent, especially if the child is over two years of age, they may be true epilepsy. Debility is always present, and the immediate cause may be rickets, gastro-intestinal disturbance, peripheral irritation, such as dentition, worms, or otitis, or the onset of infectious fevers. The fit has tonic and clonic stages of short duration, followed by sleep or stupor.

Treatment.—It is usual to place the child in a hot bath (T. 100-105°), and while there to apply cold water to the head. A hot wet pack may be used instead of the bath. The heat tends to relax the rigid muscles, and to draw blood from the brain, the latter effect being assisted by the cold application to the scalp. After being in the bath three to five minutes the child is taken out, dried, and put to bed with an ice-cap on its head. A glycerine enema should now be given, followed by a grain or two of calomel on the tongue. If the fits are very violent or long continued, the medical attendant will probably give the child a few whiffs of chloroform, and when it comes round put it on small doses of bromide of potash. Or chloral hydrate, gr. iii. to v., may be given in an enema. At the same time the predisposing cause of the convulsions will be treated.

3. *Tetany.*

TETANY is a condition of symmetrical tonic spasms of the extremities. It occurs in infants suffering from rickets or gastro-intestinal disturbance, and is sometimes accompanied by laryngismus stridulus. In adults it may follow the removal of the parathyroids in the operation of thyroidectomy, and may occur in dilatation of the stomach.

The **Symptoms** are muscular spasms affecting the extremities mainly, with swelling and tenderness of the hands and feet. The fingers are pressed together and extended at the interphalangeal joints, the metacarpo-phalangeal joints being flexed, and the thumb folded across the palm. The onset is sudden, and the duration may be from a few minutes to several hours; it persists in sleep, and relaxation is gradual. The prognosis is serious in severe diarrhœa in debilitated infants, or when the spasms are widespread.

The **Treatment** in infants is similar to that of convulsions. In adults calcium lactate is usually given, and the stomach washed out if dilated.

4. *Chorea.*

The popular name for this complaint is St Vitus's dance. It is closely connected with acute rheumatism, and occurs for the most part in children, being more common among girls than boys. Fright and mental shock are two of the most common causes.

Symptoms.—Constant fidgety movements. The child is never still, but continually moving some part of her body, making grimaces, throwing her arms about, opening and shutting her hands. Chorea varies in degree from slight twitchings to movements so violent as to render keeping the patient in bed a difficult matter. It may last from a few weeks to as many months. Endocarditis and pericarditis are frequent. The vast majority of cases recover.

but a few die of exhaustion, and a small number from acute inflammation of the heart. Recurrences are common, especially in the spring.

Nursing and Treatment.—The child should be kept in bed, and on no account be subjected to anything in the nature of ridicule or annoyance. The bed should not face the window, since a strong light tends to increase the movements. The greatest care should be taken to guard against anything which might startle the child. Sudden waking of the patient, or an abrupt entry into the room, might cause an increase in the movements. She should be kept quietly amused, and only toys given her with which she cannot injure herself. If too closely watched, the patient is apt to become nervous and the movements exaggerated. If the child is in a cot, the sides should be padded with pillows, and the same precaution should be taken when boards have to be placed along the sides of the bed to keep the patient from falling on to the floor. In these severe cases a water-bed should be used, as there is considerable risk of bed-sores occurring when the child is wasted and very restless. The bowels should be opened regularly, and a warm bath given every day. Owing to the violence of the movements, feeding is often a difficult matter. She should never be allowed to drink out of a thin glass vessel, otherwise she may bite out a piece and swallow it. An infant's feeding-bottle with a teat and long tube is sometimes useful. Solids should be given with a spoon, and not on a fork. The *diet* should be of a fattening character. Where fluid food alone can be taken, milk, beaten-up eggs, and strong soup should form the basis to which cream and some of the cereal foods may be added.

Arsenic is the drug that is most commonly used in treatment of chorea. During its administration the nurse should watch carefully for any symptoms of poisoning. It is hardly necessary to say that the temperature ought never to be taken in the mouth.

5. *Hysteria.*

HYSTERIA is a functional complaint, resulting from the working of a disordered brain. This state of disorder is due to the fact that the balance between the will and the emotions is the reverse of what it should be. Normally the will governs the brain, and, consequently, regulates and directs the actions; while at the same time it also exercises a restraining influence upon the emotions, thus preventing an immoderate display of joy, sorrow, or anger. In hysteria the emotions take the place of the will in the control of the individual, leading her to take a perverted view of life and do things which would be impossible to one who was the mistress instead of the slave of her feelings. If she has any physical ailment, constant thinking about it has caused it to assume an importance which is out of all proportion to the actual condition. Ideas control the body, and produce morbid alterations in its functions.

This malady is most common in young women, though it is also occasionally seen in boys and men. Mental and physical disturbances of various kinds are responsible for its appearance.

Symptoms.—Hysteria has been called the "mocking-bird" of disease, from the way in which it imitates or mimics the symptoms of various complaints. Different forms of paralysis, affections of sight, hearing, and touch, wasting, symptoms pointing to disease of the stomach, lungs, or joints, may all be produced by this mental disorder.

Hysterical fit generally follows emotional disturbance of some kind. In the milder form the patient has a feeling of choking, after which she begins to cry, or goes off into fits of uncontrollable laughter, or the two may alternate until she is compelled to stop by exhaustion.

In the more severe form she falls to the ground, and either becomes rigid or else goes into violent convulsions, throwing her limbs about, bumping her head against the floor, and resisting the efforts of the bystanders who are

attempting to restrain her. The eyelids are closed, and saliva may run from the mouth, but consciousness is not lost. The paroxysm, after lasting several minutes, gradually subsides.

No one who has seen an epileptic fit could possibly confuse it with one of these hysterical seizures. In the former there is loss of consciousness and absence of active resistance to interference, while the convulsions are merely the result of alternate contractions and relaxations of the muscles, and are therefore devoid of any purpose. While the former only lasts three or four minutes, the latter may go on for fifteen or twenty.

Nursing and Treatment.—It is of the utmost importance for nurses to recognise that hysteria is not the same thing as shamming, though in some cases the two are combined. What these patients most crave for is sympathy and attention. To obtain these, they strive to induce those around them to believe that they are really ill. They will even go so far as to injure themselves. So long as a hysterical patient can obtain sympathy, she will not improve. One might as well try to cure a drunkard by means of alcohol. If it is, however, wrong to sympathise, it is equally wrong to let the patient see that you know there is nothing the matter with her—as that will result in losing her confidence, and with it the chance of doing her any good.

The proper course to pursue is to treat her kindly but firmly ; reproving her when she is foolish, and encouraging her when she is good ; helping her to improve, and assuring her of her ultimate recovery—in fact, handling her like a child. A bad case of hysteria, to be properly treated, needs removal from the midst of sympathising relations and friends. Complete isolation, rest in bed, fresh air, nourishing food, and the absence of everything in the nature of mental worry, will in most cases lead to a rapid improvement. As the body gains strength, the will again begins to assert its mastery over the emotions.

The hysterical fit should be treated by loosening the

patient's clothes at the neck, opening the window, and sprinkling cold water on her face. A calm and quiet demeanour is very essential, so that she may not think the nurse flurried or alarmed by her behaviour.

6. *Neurasthenia.*

NEURASTHENIA is a functional condition, in which exhaustion of the vitality of the nervous system causes inefficiency of the mind and body. It is commonest in males between the ages of 25 and 50. It is often hereditary, or may result from prolonged mental worry.

The **Symptoms** are very varied, and may be psychical (*e.g.*, loss of power of concentration; various fears, as of death, insanity, or poverty); motor (*e.g.*, muscular weakness); digestive (*e.g.*, constipation, anorexia, flatulence); sexual (*e.g.*, nervous impotence, aching in the genitals); or cardiac (*e.g.*, palpitations, rapid heart-beat, dizziness).

Treatment.—In every case it is necessary to gain the patient's confidence, and to reassure him when it has been made certain that there is no organic disease present. If possible the cause of the condition should be removed, and rest adopted to restore the nervous system. If the cause is overwork, the rest should be for at least six months. In severe cases the *Weir-Mitchell treatment*, or rest-cure, may be advisable; it consists of prolonged rest in bed for at least six weeks, away from home and friends, with daily massage and abundant food, commencing with milk. Hydrotherapy, in the form of wet packs, douches, or spa baths, is sometimes useful. Occasionally psychotherapy in the form of suggestion is employed.

7. *Delirium Tremens.*

DELIRIUM TREMENS only occurs in those who habitually take alcohol in such large quantities that the nervous system is poisoned by it. It may come on as the result of a shock or an accident, or it may develop during an acute

illness such as pneumonia, while it sometimes follows the sudden and complete withdrawal of alcohol. The condition is characterised by extreme restlessness, the patient constantly talking and wanting to leave his bed that he may see some one or attend to his business. In a severe case the patient imagines that there are rats, or snakes, or mice in his room, and his terror in consequence is very great. He gets no sleep ; there is usually some fever, and muscular tremor is very marked. In a favourable case the symptoms begin to abate after three or four days, and the patient gradually recovers ; on the other hand, he may get weaker and weaker and finally die of heart failure.

Nursing and Treatment.—To keep up the patient's strength, and, if possible, to procure him some sleep, are the two essential elements of treatment. Unless the state of the pulse absolutely forbids it, the taking of alcohol should be completely stopped. Plenty of milk and good beef-tea strengthened by reliable meat essences should be given. If the hallucinations of sight are marked, and the patient exhibits great terror at the creatures which he fancies are in his room, or even on his bed, he must be carefully watched, as he may try to escape, and perhaps jump out of the window. Whilst forcible restraint should be avoided if possible, it is sometimes necessary to use it, and the least objectionable form is to keep the patient lying down by means of a folded sheet fastened to each side of the bed across the chest. Hypnotics will in some cases induce sleep, while in others they are entirely without effect. If the temperature is high, a wet pack sometimes has a soothing effect on the patient.

A nurse, in charge of a patient who is acutely ill and who has been a heavy drinker, should watch closely for the first symptoms of delirium and at once inform the doctor if she observes any, as hypnotics administered at this stage are more likely to be efficacious than when the condition is fully established. In the latter event she must use all her tact and endeavour to keep the patient quiet by humouring him. Bearing in mind the risks of sudden heart

failure, she ought never to struggle with him, but persuade him to stay in bed. If he imagines that he is following his daily occupation, the nurse should devise some means of fostering the delusion. Thus a bus-driver was kept quiet and contented by giving him reins to hold made of bandages fastened to the end of his bed, while another patient who was a linen-draper's assistant passed the time happily in making parcels of a few socks and handkerchiefs. Ingenuity and tact are the qualities most needed for the proper management of a case of delirium tremens.

8. *Insomnia.*

INSOMNIA, or sleeplessness, may take various forms. In one form the patient cannot drop off to sleep on retiring to bed, and lies awake for hours. This may be due to pain or worry; or it may be the result of some poison acting on the brain, as occurs in all infective diseases, in nephritis and uræmia, and in poisoning by atropine, nicotine, tea, and coffee. Its most common cause, however, is neurasthenia, in which a dread of sleeplessness often gives rise to the condition. In another form the patient gets to sleep readily, but wakes up at an early hour and cannot doze again. This may be due to the same causes as the other form, but is common in arterio-sclerosis and heart disease. A third form is characterised by frequent interruptions of sleep by dreams or nightmares. It occurs especially in children with adenoids and worms, also in neurasthenia.

Treatment.—The cause should be removed, and the opportunities for sleep made as favourable as possible. The bedroom should be quiet and well-ventilated, and the bedclothes light but warm; the stomach should not be loaded, but a glass of hot milk at bed-time will often help to induce sleep. A hot-water bottle to the feet and cold to the head may be useful. Persons who wake in the night often sleep again quickly if they can take a biscuit and a hot drink from a thermos flask, blood being thus

diverted from the head to the stomach. A hot rubber bottle to the epigastrium, or a wet pack, or a hot bath, followed by massage, is often successful, as also is a complete change of surroundings. Hypnotics should be avoided if possible, but sedatives, such as bromides, are useful. If hypnotics become essential, trional, veronal, hedonal, and paraldehyde are commonly used. The nurse should not accept a patient's account of his sleep, but keep a careful record herself. The patient should, of course, never be awakened for a sleeping draught.



Knee-jerk percussor.



Sensation Tester.

CHAPTER XX.

VARIOUS DISEASES.

I. Rheumatism and Joint Affections.

1. *Rheumatic Fever.*

RHEUMATIC FEVER, or *acute rheumatism*, is an acute infection of unknown origin. It is characterised by multiple arthritis, and by the frequent occurrence of inflammation of the endocardium of the valves of the heart, with resulting cardiac disease. Males are more often affected than females; it is most frequent between the ages of twelve and thirty-five years, and in London is at its maximum in October and November. The influence of heredity is generally accepted.

Symptoms.—After, frequently, an attack of *tonsillitis*, the rheumatic pain begins in one of the larger joints, usually the knee, wrist, or ankle, which becomes red, hot, swollen, and extremely painful. As the inflammation subsides in one joint, it appears in another. The temperature is raised, and sometimes hyperpyrexia occurs. The tongue is coated, and marked sweating is constant. *Endocarditis*, *pericarditis*, *pleurisy*, and *skin eruptions* may occur as complications. *Chorea* is a frequent form of rheumatism in children, in whom the articular lesions are often slight and overlooked, being regarded as "growing pains."

Treatment.—The special indication is to protect the heart. The patient should lie between blankets, and wear

a flannel nightgown. He should remain in bed at least five weeks after the temperature is normal. The limbs should be wrapped in cotton-wool, with a cradle to support the weight of the bed-clothes. If there is pain, the joints may be painted with methyl salicylate. Internally sodium salicylate, or salicin, is given. The *diet* should consist of milk and mild foods for three weeks, and fluids and lemonade may be freely given. Beef-tea and alcohol should be avoided. In convalescence red meat should be only sparingly used.

2. *Rheumatism in Childhood.*

Rheumatism is a common condition in childhood, and its manifestations are more varied and more serious in early than in later life. It is unknown in infancy, but from four years onwards it becomes increasingly frequent, and is commonest about twelve. There is a family history of the disease in more than half of the cases.

In adults, as stated above, acute rheumatism takes the form of a very painful swelling of the joints, with pyrexia, profuse sweating, and a liability to heart inflammation. In children more than one-half the cases have no joint affection at all, and little fever or perspiration. Languor, pallor, wasting, "growing-pains," and sore throats are often the only symptoms noticed. The heart is frequently involved, especially in a second attack. Skin eruptions, such as patches of erythema, are sometimes found. Tender red areas on the legs, called *erythema nodosum*, sometimes occur. There may be painless *rheumatic nodules*, varying from the size of a pin's head to that of a pea, over the bony prominences of the elbows, knees, or ankles, or over the spine, clavicles, scalp, and tendons of the wrist. *Chorea* is also regarded as a manifestation of rheumatism in a large proportion of the cases.

Treatment during the attack consists in clothing the child in flannel, keeping him recumbent in bed between blankets, and giving him milk diet. Painful joints should be wrapped in wool. Sodium salicylate is often given, combined with

bicarbonate of soda to prevent acetonæmia. Prolonged rest and fresh air are necessary during convalescence, and the administration of iron and cod-liver oil is of value.

To prevent recurrence, growing pains and sore throat should be treated seriously, and the child should be put to bed at once should they occur. Diseased tonsils should be removed. The child should live in a dry house, wear flannel next the skin, and avoid unnecessary exposure to cold and damp, especially sitting in wet clothes.

3. *Fibrositis.*

FIBROSITIS is a painful condition of various voluntary muscles, due to inflammation of their fibrous sheaths and periosteal attachments. It may be caused by sudden strain, or exposure to wet or draught. There are three common types—lumbago, pleurodynia, and stiff neck.

(*a*) **Lumbago** affects the lumbar muscles. The onset is usually sudden ; the pain is extreme on contracting the back muscles ; recurrence is common.

(*b*) **Pleurodynia** affects the intercostal muscles of one side. The pain is often great, and the condition has to be diagnosed from pleurisy.

(*c*) **Stiff Neck** is common in children, following draughts or a strained position of the neck.

In treatment, rest to the muscles is essential, and may be obtained by strapping. The bowels should be freely opened, and salicylates, or aspirin, given. Locally, hot sandbags, poultices, blisters, tincture of iodine, or belladonna liniment may be used.

4. *Arthritis Deformans.*

ARTHRITIS DEFORMANS, also called *rheumatoid arthritis*, or *osteo-arthritis*, is a disease of the joints of unknown origin, giving rise to changes in the synovial membranes, the surrounding tissues, the cartilages, and the bones. It causes pain, limitation of movement, and

deformities. The hands and feet, wrists, ankles, knees, and cervical vertebræ are the joints most frequently affected. It is most common in females, and usually begins between the ages of twenty and forty, in the acute, or *periarticular*, type; and between forty and sixty in the chronic, or *osteo-arthritic*, type. Pyorrhœa or carious teeth are found in nearly all these cases. A similar disease occurs in children, in which the lymphatic glands and spleen are enlarged in association with the joint affection; this is known as **Still's Disease.**

The **Treatment** consists in removing any septic focus (*e.g.*, septic teeth or tonsils, or vaginal discharge), and improving the general health by liberal diet, rest, tonics, warm clothing, and residence in a dry and sunny climate. Guaiacum and iodine are usually ordered, together with local treatment of the parts by massage, movements and exercise, or counter-irritants. For those that can afford it, spa treatment, radiant heat and hot-air baths, electrical treatment, and ionisation with sodium salicylate are sometimes useful.

II. Diseases of Deficiency.

A *Vitamin* is one of a class of substances of unknown composition, existing in minute quantity in natural foods and necessary to normal nutrition and growth. Absence of these from the diet produces "deficiency diseases," such as beri-beri, scurvy, rickets.

Vitamins of great importance are—

(1) *Fat-soluble A.*, which is necessary for growth, and is probably concerned with the prevention of *rickets*. It is present in fats (milk, butter, cream, egg-yolk, dried eggs, cod-liver oil, dripping, animal fat); vegetables (cabbages and most other vegetables); cereals and pulses (peas, beans, &c.); and certain meats (liver, kidney, heart muscle, fat fish—*e.g.*, herring and salmon). It is absent from vegetable oils, margarine, lard, malt extract, meat extracts.

(2). *Water-soluble B.*, or *anti-neuritic vitamin*, which is

also concerned in stimulating normal growth. It is found especially in the seeds of cereals and pulses, in eggs and in yeast (marmite); white flour contains very much less than whole-meal. The native of Malay, who lives largely on rice which has been polished and thus has had its vitamin B. removed, is apt to get *beri-beri*, the symptoms of which are œdema and paralysis.

(3) *Anti-scorbutic vitamin C.*, which is necessary for the prevention of *scurvy*. It is present in fresh vegetables (especially cabbages, onions, juice of swedes; also in potatoes); fruit juice (especially oranges, lemons, and tomatoes, but *not* grapes); and in small quantity in meat and milk. It is destroyed by alkalies, and by prolonged or repeated heating processes. Therefore, soda should not be used in boiling green vegetables; potatoes should not be cooked for hours in a stew; and an infant's milk should not be sterilised more than once.

(4) *Anti-rachitic vitamin D.*, which is essential for the proper calcification of the bones. It is efficient in preventing and curing *rickets*, and occurs in butter fat and cod-liver oil, but not in vegetable oils. It is peculiar in that it can be produced by the action of ultra-violet light on cholesterol.

1. *Rickets.*

RICKETS or *rachitis*, is a disease of metabolism occurring in late infancy, attended by changes in the development of the bones. It is rare under six months and over three years, and is most common at one or two years; it occurs mostly in artificially-fed children. Early cases are most frequently met with in the spring months, following the winter season during which sunlight is scarce. It has been ascribed to feeding on a diet containing an insufficient quantity of the vitamin fat-soluble D., to lack of sunlight, and to absence of a proper amount of exercise.

In addition to delayed dentition and changes in the bones, the **Symptoms** are sweating, especially at night, bronchitis, and disturbances of the digestive system, such as abdominal distension, flatulence, muscular relaxation, enteritis, and enlargement of liver. The bone changes are beading of the ribs ("rickety rosary"); pigeon-breast; a groove from the ensiform cartilage outwards ("Harrison's sulcus"); enlarged epiphyses, especially at the lower end of the radius; enlarged and bossed head ("hot-cross bun" head), with patent anterior fontanelle; curvature of the tibia, the femur, and, less commonly, the spine and the upper extremity. The ligaments are lax, and the muscles weak and deficient in tone ("hypotonia"). The child is often fat, but flabby.

The **Treatment** consists in correcting the alleged causes, *i.e.*, supplying a sufficiency of fat, adding cream to each bottle, or giving cod-liver oil; exposing to sunlight and fresh air; and giving exercise in the form of massage. Rest is necessary to prevent deformities, especially if the child is fat. A daily bath with cold douching is useful.

2. *Scurvy.*

SCURVY, or *scorbutus*, is a "disease of deficiency," due to the absence from the diet of the anti-scorbutic vitamin C. contained in fresh food. It is characterised by swelling of the gums, by anæmia, and by a tendency to hæmorrhages. Hæmorrhage may take place from the nose and mouth, under the conjunctiva, in the skin and subcutaneous tissues, and under the periosteum. It may be prevented by eating fresh vegetables, fruit, or meat. It is treated by giving the juice of fresh oranges or lemons.

Infantile Scurvy, or *scurvy rickets*, is a similar condition, occurring usually at the age of eight months in infants fed on a diet of proprietary foods, condensed milk, or cow's milk which has been over-sterilised. The onset of severe symptoms is often sudden; there is extreme tenderness everywhere, and the child screams when moved or touched; if teeth are present, the gums are spongy; there

is often a tender swelling of the lower part of the shaft of the femur, due to hæmorrhage under the periosteum; hæmaturia also may occur. The child should be fed on unboiled milk, and orange or swede juice, four teaspoonfuls, given daily. The limbs should be wrapped in cotton-wool, and means taken to keep off the weight of the bed-clothes.

III. Diseases of the Ductless Glands.

(*a*) The Thyroid Gland.

1. *Cretinism.*

CRETINISM is a condition of arrested mental and bodily development, arising from an insufficient supply of the internal secretion of the thyroid during the early years of life. The growth is stunted, the head large, the abdomen prominent, the face broad, and the nose flat. The skin is dry and has an œdematous appearance, but does not pit on pressure. Mentally, the child is stolid, and in advanced stages may be imbecile.

It is treated by the administration of dried thyroid gland in tablets, and the treatment must be continued throughout life. With suitable dosage growth proceeds at the normal rate, although mentally the child may be backward. If the dosage is excessive, the patient shows rapid loss of weight, restlessness, quick pulse, diarrhœa, and pain in the limbs.

2. *Myxœdema.*

MYXŒDEMA is a similar malady occurring in adults, and is due to the absence of thyroid secretion through disease or removal of the gland. It is much more common in females than males. The disease is characterised by slowness in all functions—mental, muscular, and metabolic. The appearance is characteristic; the features are broad

and expressionless, with puffy eyelids; the complexion is yellow, with a red patch on each cheek. The skin is dry with an appearance of œdema, and the hands and feet are large. The mental condition and speech are slow, and the memory defective. It is treated by preparations of thyroid gland.

3. *Exophthalmic Goitre.*

EXOPHTHALMIC GOITRE, known also as *Graves's disease*, is due, on the other hand, to an abnormal activity of the thyroid gland, the cause of which is unknown. It is ten times more common in women than in men. The symptoms are enlargement of the thyroid, which often pulsates visibly; rapid pulse (*tachycardia*); staring expression, with eyeballs protruding and lids retracted (*exophthalmos*); and fine tremor of the limbs. The condition reaches its maximum at the end of a year. Emaciation, sweating, glycosuria, and exhaustion may occur; the patient is irritable, and may become melancholic.

The **Treatment** should include prolonged rest and ice to the gland. Mild exercise later. Diet should be simple, chiefly milk and vegetables; no alcohol or tobacco. X-rays may be applied, or part of the gland removed by operation.

4. *Goitre.*

GOITRE, also called *bronchocele*, is a chronic general enlargement of the thyroid gland of unknown origin, producing symptoms by pressure. It is very prevalent in Switzerland; in England it is most frequent in Derbyshire, and is thus often called "Derbyshire neck." It is much more common in females, and commences generally about puberty. Persons drinking from certain wells are apt to become goitrous, recovering on leaving the district. Boiling the water is said in some cases to make it harmless. Some hold that the condition is due to a deficiency of iodine in the water. Any thyroid which forms a swelling in the neck should be regarded as enlarged. If the gland is very

large, or passes behind the sternum, it may cause pressure symptoms—*e.g.*, dyspnœa, or inspiratory stridor and cough.

Treatment.—Small, soft, and early goitres, especially in young people, often recover on medical treatment, or on leaving the goitrous district. The water should be boiled. Iodide of potassium is given internally with good result, or iodine may be applied locally. X-rays are sometimes used.

(*b*) The Thymus Gland.

The thymus gland is situated in the lower part of the neck and behind the upper part of the sternum. It is a temporary organ, attaining its full size at the end of the second year, when it ceases to grow, and gradually dwindles until at puberty it has almost disappeared. No internal secretion has been obtained from it. In the condition known as *status lymphaticus*, in which there is a liability to dyspnœa, syncope, and anaphylactic shock, the thymus is enlarged as part of a general adenoid enlargement.

(*c*) The Suprarenal Bodies.

The suprarenal, like the thyroid, is an "endocrine organ"—*i.e.*, a ductless gland with an internal secretion. Within the capsule are two layers, the cortex and the medulla, entirely distinct in function. Of the function of the cortex little is known. The active principle of the medulla, however, has been isolated, and is known as **adrenalin**. It has the power of constricting the peripheral blood-vessels, and raising the blood-pressure.

Addison's Disease.

ADDISON'S DISEASE is a rare condition, in which the suprarenals are found affected by tuberculosis. It is characterised by progressive muscular weakness, vomiting, and

pigmentation of the skin, with a low blood-pressure, and a tendency to cardiac failure. It is usually fatal in one to three years.

(*d*) The Pituitary Body.

The pituitary body, which lies at the base of the brain, is a ductless gland, consisting of a larger anterior lobe and a smaller posterior one.

The secretion of the anterior lobe increases the growth of bones, and influences sexual activity. If it secretes too much, *gigantism* results in young children and adolescents, and *acromegaly* in adults.

The secretion of the posterior lobe influences the metabolism of carbohydrates and fats. If the secretion is excessive, an abnormally high percentage of sugar is found in the blood (*hyperglycæmia*), and sugar appears in the urine (*glycosuria*). If the secretion is deficient, obesity results, and the sexual organs become infantile (*Fröhlich's disease*).

Pituitrin is an extract of the posterior lobe; when injected, it raises the blood-pressure by contracting the vessels, and stimulates the contraction of the muscular coats of the small intestine, bladder, and uterus.

(*e*) Ductless Areas in the Pancreas.

Scattered throughout the pancreas are small areas which take no part in the formation of the pancreatic juice. These are known as the "islands of Langerhans," and they manufacture, and pass into the circulation, an internal secretion or *hormone*, **insulin.** Insulin is essential for the burning up of glucose in the tissues. If the secretion of insulin is deficient, then the tissues no longer have the power of using glucose as a fuel; the result is that it accumulates in the blood (*hyperglycæmia*), and so gets into the urine (*glycosuria*). This condition constitutes **Diabetes mellitus.**

There is another serious result. It depends on the fact

that the complete burning up of fats is only obtained when there is free combustion of carbohydrates. (In the same way coke burns better if mixed with coal.) When glucose cannot be used as a fuel, the fatty acids, instead of being burnt right up to carbon dioxide and water, remain in a half-oxidised condition as *diacetic acid* and other ketones. These poisonous substances accumulate in the blood (*ketosis* or *acidosis*) as the disease progresses, and eventually poison the nervous system, bringing on a condition of *coma* which is nearly always fatal.

DIABETES begins most frequently between the ages of forty and sixty; it is least common, but most fatal, in childhood. Obesity is often associated with it; it is more common in the upper classes, and among the Hebrews. The *urine* amounts to from 6 to 8 pints a day; it is very pale, has a high specific gravity (usually 1025 to 1045), and contains sugar. The characteristic *symptoms* are an enormous appetite, thirst, excessive secretion of urine (polyuria), emaciation, and weakness. Boils, carbuncles, gangrene, pruritus, pulmonary tuberculosis, cataract, and diabetic coma occur as *complications*.

In **Diabetic Coma,** the patient becomes drowsy, and has the form of dyspnœa well described as "air-hunger"; he then loses consciousness, and his breath acquires the odour of "apples packed in hay." He usually dies within forty-eight hours, unless relieved by insulin.

Treatment.—Until recently the only available treatment for diabetes consisted in giving a considerable amount of sodium bicarbonate to neutralise the acids, and in keeping the patient thin by starvation so that he possessed a smaller amount of tissues between which to share his diminished supplies of pancreatic hormone. Now *Insulin* is obtainable, extracted from the pancreas of animals with alcohol of sufficient strength to destroy the trypsin that is present. It must be used with care, as too large or too frequent doses lead to an abnormally low percentage of sugar in the blood (*hypoglycæmia*), and so produce serious symptoms, sometimes even a fatal result.

Methods of Treatment.—(1) By **Restriction of Carbohydrates.**—This is used in the case of an elderly person with moderate glycosuria. The patient is placed by a gradual reduction on a carbohydrate-free diet, and maintained on this for two weeks after the sugar in the urine has disappeared. Then white bread is added to the diet, an ounce at first, increasing by an ounce every third day until sugar appears. The amount of carbohydrates in the food at which sugar commences to reappear in the urine constitutes what is called "the limit of carbohydrate tolerance." The carbohydrate diet which is finally fixed for the patient should not contain more than two-thirds of this quantity. A fast day should be kept once weekly. The carbohydrate-free diet consists of meat, fish, poultry, eggs, bacon, green vegetables, diabetic bread, tea, coffee, brandy, and whisky. The great drawback is the limitation of bread and potatoes. The principal substitutes for bread are almond biscuits and gluten or bran bread (see p. 61).

(2) By **Restriction of all Food (Allen's Method).**—This was intended for the more severe cases, such as are specially met with in young subjects. The administration of insulin is usual nowadays in these cases.

(3) By **Moderate Restriction of Food assisted by Insulin.**—This treatment has often to be carried out by the patient, who gives his own injections, learns the dangers of over-dosage, and himself tests his urine for sugar and diacetic acid. Nurses should, therefore, be familiar with the methods adopted.

The *calorific requirements* of the patient are first calculated by the physician. The requirement per kilogram of body weight per day is generally about 30 to 35 calories for a sedentary life, and 40 or more for fairly hard work. The aim is to give the patient sufficient food to supply his calorific requirements, and enough insulin to enable him to utilise this food. The "line ration scheme" of dietary (devised by R. D. Lawrence and published in a convenient form by Messrs H. K. Lewis & Co.) may then be used. Each "line" is divided into two halves, the first half

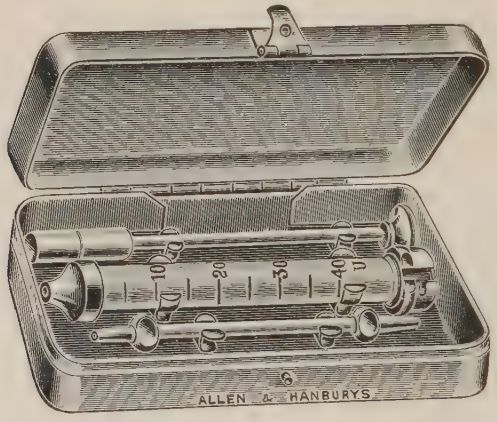
containing the carbohydrates and the second the protein and fat, *e.g.*, tomato or garden turnip, 5 oz.—lean lamb or veal, 1 oz., and fat or butter, ½ oz. Each line has an energy value of 190 calories, so that the physician can calculate the number of lines to prescribe by dividing the total number of calories required by 190. The patient is simply told how many lines he has to take per day, and he can choose his own dietary from the list. Carbohydrate, protein, and fat should be taken in the exact amount thus prescribed by the physician. All food should be weighed, the weighing being done in the kitchen on a "confectioner's" scale. No flour or sugar may be used in cooking, and bread crumbs must not be used for frying. Saccharin may be used for sweetening. To secure enough vitamins, butter should be used in preference to margarine, marmite should be used for flavouring, and lemon juice taken at intervals.

The dietary having been fixed by this or other method, the physician ascertains how much *insulin* is required to enable the patient to use it. This can be done by estimations of the sugar in the urine or in the blood. Injections of 5 units twice a day are given for three days. If glycosuria persists, the dosage is gradually raised to 10 and 10 units, and later to 15 and 10 units, or more if required. When glycosuria disappears, the dosage is approximately correct for the diet. It is generally preferred, however, when possible, to ascertain the correct dosage by estimations of the sugar in the blood.

Caution.—To obviate any risk of insulin reducing the blood-sugar to a dangerously low level, each injection should be followed by a meal in about a quarter of an hour. It should be given twice a day, before breakfast and supper. The patient should be instructed to carry always a few lumps of sugar in his pocket, and to take some at the first symptoms of *hypoglycæmia* (viz., sense of weakness, shakiness, faintness, mistiness of vision, perspiration, flushing, or pallor). Severe hypoglycæmia may produce convulsions, coma, and death. It is treated by

the administration of 1 oz. glucose by mouth, or half a pint of a 20 per cent glucose solution intravenously ; 1 c.c. of adrenalin (1-1000) may be given intramuscularly.

Administration of Insulin.—A special insulin syringe, graduated in units, may be used, or a 1 c.c. tuberculin syringe marked off into twenty divisions, each of which will then correspond to one unit of insulin. To sterilise the syringe and needle, rinse in boiled water, and then immerse in absolute alcohol contained in a stoppered bottle, in which they may be stored. Before using, remove



Insulin Syringe, graduated in units.

the alcohol as far as possible by moving the plunger up and down several times. (Lysol or other alkaline liquids should not be used for sterilising the syringe on account of their tendency to cause precipitation of the insulin.) In withdrawing the insulin from the rubber-capped phial, do not remove the cap, but clean it with spirit or ether, place a drop of sterile water on it, and plunge the needle through the rubber. Then invert the phial, and, with the point of the needle lying in the liquid, move the plunger up and down several times to expel the last traces of air from the barrel. (A little air injected into the phial makes

it easier to draw the insulin out, as it prevents a partial vacuum forming.) Then withdraw the plunger until the required dose is contained in the barrel. The puncture in the rubber cap will close when the needle is withdrawn. It must be noted that if the insulin is not quite clear, it is bad.

Insulin is generally given subcutaneously, the skin at the site of injection having been previously sterilised by cleansing with ether or some suitable antiseptic. The best sites are the front and outer aspects of the thighs, the abdomen, and the lower part of the chest. The pain of the puncture can be minimised by the use of a fine sharp needle, and by inserting this as nearly as possible at right angles to the skin. By moving the needle lightly over the skin it is usually easy to find a spot insensitive to a prick. Thickening of the skin can be avoided by changing the site of injection from one part of the body to another; no two punctures should be made in exactly the same spot within forty-eight hours.

Tests for Patient's Use.—(*a*) *For Diacetic Acid.*—It is important that the patient should each morning allow two drops of liquor ferri perchloridi to trickle down the side of a test-tube containing a specimen of the urine. If the colour changes from yellow to dark brown, the doctor should be informed immediately, for it indicates the presence of diacetic acid. The presence of diacetic acid in the urine is more disquieting than sugar, since it indicates that fat is not being properly metabolised, and that, therefore, there is some risk of coma. More carbohydrate added to the diet enables the fats to be properly consumed, and, to allow this extra sugar to be metabolised, more insulin must be given.

(*b*) *Benedict's test for sugar* is a simple test often employed by patients. Eight drops of urine are placed in a clean test-tube; 1 in. of Benedict's solution (prepared from sodium citrate and carbonate and copper sulphate) is added, and the tube boiled vigorously for two minutes in a spirit flame. With much sugar a yellow or brick-red

colour results. With only a little sugar the fluid becomes green and turbid, a red-yellow deposit settling on standing. Without this deposit the test is negative. The exact quantities stated should be used.

Management.—In severe cases it is best to begin treatment with the patient in bed. In the less severe cases he will be able to lead his ordinary life during treatment, but over-fatigue and chill should be avoided. Exercise short of fatigue is usually beneficial. Oral sepsis must be attended to, and the bowels must be opened regularly. As far as possible the risk of infection with influenza and tuberculosis should be eliminated.

CHAPTER XXI.

THE CHILD IN HEALTH AND SICKNESS.

1. Growth and Development, &c.

Weight.—An average baby weighs 7 lb. at birth, and during the first three days loses 5 or 6 oz., owing to the passage of urine and meconium and the fact that it receives but little nourishment. The lost weight is usually regained by the tenth day. At the end of four months the weight should be double that at birth, and at the end of twelve months treble it. In the second year he gains about 6 lb., and thereafter 4, then 5, and later 6 lb. yearly until the age of twelve, when the increase becomes more rapid.

Length.—The length at birth is about 20 in.; about 8 in. is added in the first year; then about $3\frac{1}{2}$ in. each year until five years old; and subsequently about 2 in. annually. Growth is greater in the spring and summer.

Anterior Fontanelle.—This generally closes between the fifteenth and eighteenth months. Premature closing occurs in microcephalus, while delayed closing is common in hydrocephalus, rickets, and cretinism.

Digestive System.—The average capacity of the *stomach* is $1\frac{1}{2}$ oz. at birth, 6 oz. at six months, and 9 oz. at one year. Gastric digestion is not very important in infancy. Breast milk is usually coagulated within fifteen minutes by the rennet-ferment, and before an hour has elapsed has to a great extent passed on into the intestines, only partially digested by the gastric juice. Cow's milk takes a little

longer. Thus an infant's stomach is empty in from 1½ to 2½ hours after feeding; earlier in the first month.

The starch-digesting property of *saliva* does not become fully established until the end of the first year, and *amylopsin* is not secreted by the pancreas in any considerable quantity until about the time of the cutting of the milk teeth. Until this time, therefore, starch can only be digested—that is, converted into soluble maltose—in small amount; if taken in excess, it passes undigested into the large intestine, where it is broken down by bacteria into acids which have irritating properties, and gases which distend the bowel and cause griping.

Glands.—*Sweat* is usually observed at the end of the first week, and *tears* usually appear when the child is between two and four months old. The *testicles* are normally in the scrotum at birth, but sometimes are absent on one or both sides, the organ descending during the first month or later. If descent does not occur during the first year, the testis is usually accompanied by a hernia when it does appear.

Sleep.—In the first few weeks the infant should sleep practically all the time he is not being attended to—*i.e.*, twenty hours or more a day. When a year old he should have about fifteen hours' sleep each day, and about thirteen hours in the second and third years, one or two of these hours being in the afternoon. For school-children, nine hours' sleep should be the minimum.

Sensory Organs.—A normal child should show that he knows his mother's face by the third month; by the sixth he should recognise many things. During the first day or two of life all children are deaf, but by the second week they should hear loud noises well.

Voluntary Motion.—Apart from aimless kicking, &c., the earliest movements of a child are reflex, as in blinking, or instinctive, as in sucking. Voluntary movements are only gradually acquired. A baby cannot hold his head erect until three or four months old; while he will attempt to sit up at six or eight months, he cannot remain so for

long unsupported until he is eleven or twelve months old. He may creep as early as the ninth month, and generally tries to stand by the ninth or tenth month. He walks on an average in the fourteenth or fifteenth month, and, unless rickety, idiotic, or paralysed, always does so before the age of one and a half years. If a child who has been walking for some time ceases to be able to do so, he probably has developed rickets.

Speech.—By the time the child is a year old, he knows the meaning of a good many words, and is able to utter a few sounds with a definite meaning. At the end of the second year he begins to use short phrases. Backwardness in speech may be due to idiocy, deafness, or general backwardness in development, but it occasionally occurs in children with none of these defects.

Clothing.—Dr Truby King says the best all-round material for baby clothes is the cheapest flannel, which is warmer and shrinks less than expensive flannels. To prevent the itching which is liable to occur with its use, he advises a thin, soft, open material made of silk and wool next the skin. Flannelette should be avoided owing to the risk of fire. Long clothes hamper an infant, and there is no good reason for their use. All clothing must be loose, and garments should be enlarged or discarded before they become too small. The binder should be given up when the cord is healed. The singlet should be long enough to pin to the napkin. The napkin should be triangular; a small portion of any similar soft absorbent material, folded into a square, should be placed on it in such a position as to absorb the urine. A square napkin folded into a triangle is unduly bulky between the legs, and hampers movement. When the time comes for shoes to be worn, care should be taken that they have a straight inner border, and that they are replaced before they get too short.

Playing.—The custom of regarding the baby as a plaything is to be discouraged as tending to make it nervous and irritable. It requires quiet and peaceful surroundings, and especially should never be excited just before bedtime.

Mental precocity should be repressed rather than encouraged.

Exercise.—A large amount of exercise should be encouraged from a very early age in the form of vigorous sucking, kicking, moving the arms, &c., and, later on, crawling. At least twice a day the infant, lightly clad and protected from draughts by a screen, should have for about fifteen minutes the unhampered use of its limbs. A pen on a piece of cork carpet is useful for the purpose as it gets older; this may be stood out-of-doors in suitable weather.

II. Dentition

The **Temporary Teeth,** or milk teeth, are twenty in number; they appear in pairs, those of the lower jaw a little earlier than the corresponding ones above, except in the case of the lateral incisors. On each side of each jaw there are five teeth: central incisor, lateral incisor, canine, first molar, second molar. They usually appear in the order given, except that the canines appear after the first molars. The dates of appearance vary greatly: roughly it may be said that the average child has four teeth fewer than its age in months. Thus a child of six months usually has its two central incisors; one of twelve months, eight teeth; one of twenty-four, the full set of twenty.

During each bout of teething the child is usually out of sorts: local pain in the jaw is evident, and he is flushed and restless. There may be loss of appetite, and diarrhœa or constipation. Eczema and coughing, with or without bronchial catarrh, are not uncommon.

Unless previously decayed, the temporary teeth begin to get loose as the permanent teeth are about to appear. When they become carious, any cavities in them should be dealt with by the dentist at once.

The **Permanent Teeth** number thirty-two. The first to arrive is the first molar at the age of six. Its position is *behind* the temporary second molar; its advent is often

overlooked by parents, with the result that it is allowed to decay in the belief that it is one of the temporary teeth. The second molars appear at the age of twelve, and the third molars (wisdom teeth) at eighteen or later. The incisors (at seven or eight years), the canines (at eleven or twelve years), and the bicuspids (at nine or ten years) take the place of the temporary incisors, canines, and molars respectively. Sometimes the central incisors appear before the first molars.

The tooth-brush should be used night and morning with a simple alkaline tooth powder, and a careful eye should be kept on the condition of the first molars.

III. Breast-Feeding.

Importance of Breast-Feeding.—It cannot be questioned that breast-milk is the best food for a new-born infant, and the responsibility of advising the mother not to suckle her child is a heavy one. Particularly important is breast-feeding during the first six weeks or two months of life, for at this time the dangers of hand-feeding are specially great. When it is realised that about one-fourth of all deaths occur in the first year of life, and that of these 60 per cent are due to gastro-intestinal disturbances, it will be apparent how important the proper feeding of the infant is.

Management.—During the first day when there is practically nothing in the breast the infant should be put to it every six hours. Though it derives little in the way of nourishment from this proceeding, the suckling assists in keeping the womb contracted and hastens the secretion of milk. Should the child be restless or cry as if from thirst, a teaspoonful of sweetened water may be given it occasionally, but it should be remembered that a certain amount of crying is essential for the proper expansion of the lungs. During the second day it should be given the breast at four-hourly intervals, while on the third day when the milk

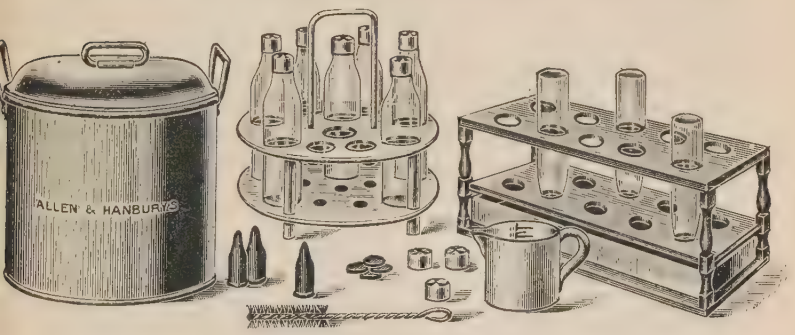
appears it may commence two-hourly feeds between 6 A.M. and midnight. From the sixth to the tenth week eight two and a half hourly feeds may be given from 6.30 A.M. to midnight; after that time, six three-hourly feeds from 7 A.M. to 10 P.M. In many cases, however, a beginning is made during the first week with three-hourly feedings, and this practice should be encouraged.

While she is suckling, the mother should support the breast in such a way as to prevent it pressing against the child's nose and interfering with its respiration. If possible, only one breast should be used at a feed. If the milk is taken too greedily, the mother should control the flow by compressing the nipple between her first and second fingers, or she may remove the child from the breast for a short time in the middle of a meal. The proper way to stop a child's sucking is to put the finger in its mouth. This prevents dragging on the nipple. When it has finished, the nurse should see that the nipple is washed with warm water and dried with a soft cloth, for a cracked nipple is a source of great discomfort to a mother, which may compel her to discontinue nursing the child, while it may also be the starting-point of a breast abscess by providing a point of entry for germs. Between the feeds the breasts should be covered with a large square of lint, and they should not be subjected to pressure by a corset.

It happens sometimes that a new-born infant *does not thrive on breast-milk*. This is most commonly due to indigestion caused by overfeeding and irregular feeding, the two frequently being combined. A child which has been overfed is not unlikely to suffer from flatulence and abdominal pain. If, to quiet it, the mother puts it to the breast, the condition is naturally made worse. The composition of the milk itself is only occasionally abnormal if the mother is healthy, but the quantity is often wrong. A child is having the *proper quantity* of food if it increases normally in weight, does not vomit, and the stools are healthy. It is having *too much* if it is restless and cries from colic, or

if it has large loose stools with curds in them, or if the weight increases more rapidly than normal. It is having *too little* if it is quiet, with retracted abdomen, constipation, small dry stools, and stationary or decreasing weight. Test-meals will settle the matter if there is doubt.

An *insufficient supply of milk* may be the fault of the child or of the mother. The *child* may be premature; it may have hare-lip or cleft palate; or it may develop snuffles, thrush, pyrexia, or dyspepsia. The latter complications, or the onset of difficulty in breathing through the nose when the nipple is in its mouth, may lead to an infant who has been doing well getting insufficient nourish-



Soxhlet's Milk Sterilising Apparatus.

ment. The *mother* may have depressed or sore nipples; she may be over-anxious as to the breast-feeding; she may be overworked; or she may over-indulge in social activities. She can encourage the flow of milk by drinking water just before feeding time; or bathe the breasts for five minutes with hot and cold water alternately; or massage them twice daily for ten minutes. It is most important, too, that the child should empty the breast each time, for if it does not do so the quantity will rapidly decrease.

Test-Meals.—The question whether the amount of milk received by the breast-fed child is sufficient or not can be

decided by weighing it, clothed, before and after *all* the feeds given in the twenty-four hours, and seeing what the total of the differences in weight amounts to. An infant requires $2\frac{1}{4}$ or $2\frac{1}{2}$ oz. of breast-milk per pound body weight per day.

If the quantity continues deficient for a fortnight, it is better not to delay *supplementary feeds* of equal parts of sweetened cow's milk and water after the 12, 3, and 6 o'clock feeds.

Weaning should be done gradually at the age of nine months. Should it fall due to be weaned in August or September, it would be wiser to keep it on breast-milk a little longer, as during the two months named *infantile diarrhœa* is specially prevalent.

It being decided that the time has arrived for weaning, Burgess recommends that it should be carried out in the following way. During the first week one feed of cow's milk and water is given in each twenty-four hours, in place of a breast feed, preferably at 8 A.M. During the next week two of the breast feeds are replaced by cow's milk and water, at 8 A.M. and 8 P.M. During the third week the child should have three feeds of breast-milk and four of cow's milk, the first, last, and middle feeds being provided by the mother. During the fourth week only the first and last feeds will be breast feeds, the others being given from the bottle. After the fourth week the child is fed entirely by the bottle.

The Diet after Weaning.—The transition from the breast to ordinary diet must be gradual. Milk which has been pasteurised ought still to form the foundation of the child's dietary until it has attained the age of two years. During the first six months of this period starchy foods are gradually introduced. These should largely consist of rusks and biscuits, since they are comparatively easy of digestion and give exercise to the teeth and muscles of the jaws. The importance of fat must not be forgotten. Fresh fruit juice is very beneficial, and plain water should be given as a drink between meals. The following diets

will serve to show how a growing child should be fed. Many variations in them would naturally be made.

Nine months to a year—

7 A.M., 6 oz. of milk.
10.30 " 6 oz. of milk and a buttered rusk.
1.30 P.M., 6 oz. of milk with the yolk of an egg in it, or the same quantity of beef-tea and a rusk.
5 " 6 oz. of milk with a biscuit or rusk.
9 " 6 oz. of milk with Mellin's or Benger's food in it, or Chapman's entire wheaten flour.

One year to eighteen months—

7 A.M., 8 oz. of milk and a rusk.
10.30 " a lightly boiled egg and a thin slice of bread and butter.
1.30 P.M., a mashed potato and gravy, or rusk and gravy, and a tablespoonful of light milk pudding.
5 " 8 oz. of milk and a buttered rusk.
10 " 8 oz. of milk containing Mellin's food or Chapman's flour.

Eighteen months to two years—

7.30 A.M., a breakfast cupful of milk and buttered rusk, or a slice of thin bread and butter and a lightly boiled egg.
11 " a breakfast cupful of milk and a biscuit.
2 P.M., a tablespoonful of fish or underdone meat with a potato and gravy, followed by a good tablespoonful of milk pudding.
5 " a breakfast cupful of milk and a small slice of bread and butter.
10 " a cup of milk if the child wishes to have a drink.

Older children (see p. 43).

IV. The Artificial Feeding of Infants.

Elements of Food.—In infancy, as in later life, the elements of food are five in number: proteins, carbohydrates, fats, mineral salts, and water. The infant needs these elements in forms and in proportions different from

those required by the adult, partly on account of the delicate structure of the organs of digestion in infancy and their inability to deal with certain kinds of food, partly because provision has to be made, not only for the natural waste of the body, but also for its rapid growth, trebling its size, as it does, in the first year of life.

Proteins and *mineral salts* are the tissue-builders. *Fat* is chiefly of value for the maintenance of the body temperature. *Carbohydrates* are a source of muscular energy and heat; they may be partly converted into fats and thus increase the body-weight.

In **milk,** *protein* is present in two forms—lactalbumin and casein. *Lactalbumin* does not form a curd with rennin, the curdling ferment of the gastric juice, and is therefore easily digested; it constitutes more than half the protein in mother's milk. *Casein* is coagulated by rennin, and therefore calls for stronger digestive action; cow's milk contains more than five times as much as human milk. The *fat* is present as minute globules, obviously specially fitted for easy digestion. *Carbohydrate* is in the form of lactose, or milk-sugar, which is in a state of complete solution.

Comparison of Human and Cow's Milk of Average Quality.—

	Human Milk.	Cow's Milk.
Proteins { casein . . . / lactalbumin .	·5 / ·7 } 1¼ per cent	2.7 / .8 } 3½ per cent
Fats—as minute globules	3½ " "	3½ " "
Carbohydrate—as lactose	6½ " "	4½ " "
Reaction	Alkaline or only faintly acid	Distinctly acid
Sterility	Practically sterile	Usually teeming with bacteria

Modification of Cow's Milk.—As will be gathered from the above observations, modification is required in two directions when cow's milk is used as a substitute for

human milk : the milk must be rendered clean, or free from germs, and, secondly, its composition must be altered so that it more closely resembles human milk. It is obvious, however, that while the quantities of the ingredients can be altered, the inherent differences of the proteins must still remain.

Freeing Milk from Germs.—Ordinary milk abounds in bacteria, the commonest being the lactic acid bacillus, the germ which sours milk ; bacteria producing putrefaction are sometimes present, the typhoid bacillus is occasionally found, while the tubercle bacillus is fairly common. Many cases of tuberculosis of glands and peritoneum are believed to owe the infection to milk.

If milk can be obtained fresh and germ-free it is preferable uncooked, and in some districts milk guaranteed clean and free from tubercle bacilli ("certified milk") can be bought. Generally, however, sterilisation by heat must be adopted in one or other of three forms—pasteurisation, simple boiling, or sterilisation at 212° F. in a Soxhlet steriliser or a double saucepan. After being heated, milk should be rapidly chilled in cold water, and kept at a low temperature in order to retard the growth of germs ; it is also very important to adopt precautions against fresh contamination.

(*a*) *Pasteurisation.*—The milk is raised to 155° F., and kept at this temperature for thirty minutes ; a thermometer should be used in regulating this. Mothers often find pasteurisation somewhat difficult to carry out exactly, and in actual practice it is doubtful whether its advantages compensate for the uncertainty of the process as ordinarily carried out in the home. In most large towns nowadays, however, properly pasteurised milk can be obtained in capped bottles.

(*b*) *Boiling* is the method which has in general to be adopted among the poorer class. The milk should be heated in a double saucepan until the water in the outer compartment has boiled for three minutes.

(*c*) *Sterilisation in a Water-bath.*—The *Soxhlet steriliser*

is a useful apparatus for carrying out this method, and where the milk is not supplied already pasteurised it has much to recommend it.

Altering the Composition.—Experience shows that it is not necessary to dilute the milk to the extent of making the proportion of *protein* the same as in mother's milk, for most infants will digest a larger proportion of casein than the composition of mother's milk would suggest. It is obvious that, if cow's milk is diluted to make the amount of *protein* even approximately right, it will become poorer in fat and much poorer in sugar than mother's milk. *Sugar* has therefore to be added in making a milk-mixture. A fair proportion of *fat* in the food is also necessary, otherwise rickets is apt to develop; on the other hand, if it be added in such quantity as to make the percentage of fat exceed that of mother's milk, vomiting or diarrhœa usually results.

In addition to the three classes of foodstuffs referred to above, there are important constituents of fresh milk, the *vitamins*. These are all liable to be impaired by heat, but the most delicate is the one which prevents the development of scurvy, and which is also present in the juice of oranges and swedes. For this reason at least a teaspoonful of one of these juices should be given daily to an infant who is being artificially fed, whether with boiled cow's milk, condensed milk, or dried milk, the quantity being increased as the child gets older.

Feeding Appliances.—The forms of *bottle* to be recommended are the boat-shaped bottle and the Soxhlet bottle. The former is well known; the latter has a flat bottom and can stand upright for warming; both are readily cleaned. At least two bottles and teats should be in use. The *teat* should simply fit over the mouth of the bottle, no tube or screw being permissible. The hole in the nipple should be large enough for the milk to drop rapidly when the bottle is inverted, but not so large that it will run in a stream. A proper *milk-saucepan* is advisable, or a Soxhlet steriliser may be used. A large mixing pitcher or pan, a

spoon for stirring, an 8-oz. graduated measure, bottle-brushes, bicarbonate of soda, and boric acid should also be provided. A graduated pint measure is necessary if food for twenty-four hours is being prepared.

Immediately after use the teat should be rinsed, turned, and scrubbed, and then kept in clean water. The bottle should be rinsed *at once* with cold and then with hot water, then washed with soda or soap solution, a bottle-brush being used, again rinsed, and finally placed in a basin of clean cold water or boric acid solution. If the bottle dries before being thoroughly cleansed, the hardened particles of milk are difficult to remove. Before use, rinse again. Once a day the bottle should be boiled.

Preparation of the Feeds.—Each feed may be put up separately, or the total amount for twenty-four hours may be prepared. The milk and water should be measured in a graduated glass. The sugar, strictly speaking, should be weighed, but, provided it has been ascertained what a drachm of sugar amounts to in a teaspoon reserved for the purpose, it will suffice to use this as a measure.

Mode of Feeding.—Before giving a feed the nurse should wash her hands. The baby's napkin should be changed after, not before, a feed.

The *temperature* of the feed requires more careful attention than is generally given it. The bottle should be so warm that it can be comfortably held against the nurse's cheek. Warm the food up again, after half has been taken, by standing the bottle in hot water.

If the child is asleep he should be wakened, for the regular intervals must be kept. During feeding he should be held half-reclining on the nurse's lap, with head and back supported.

Give the feed slowly, keeping the teat full to prevent air being swallowed. Each feed should not take less than ten or more than twenty minutes. If the child is allowed to drink faster than this, the food is apt to be regurgitated.

When air is swallowed during a feeding it is generally due

to the fact that the bottle has been held too horizontally. It may also be swallowed between feeds, if a child sucks a comforter or his thumbs. When inconvenienced by wind in the stomach which he cannot disperse, he usually shows signs of restlessness, opening and shutting his mouth, stretching out his head and yawning. He should be held on the nurse's left arm with his head thrown over her left shoulder and his abdomen pressed against her chest. If his back is patted while he is held in this position the abdomen will be compressed and the gas mechanically discharged. It is well to adopt this measure after each feeding.

An infant should *not be coaxed* to take food, and, except while the bottle is being rewarmed, he should not be allowed intervals during a meal. The habit of putting a bottle beside a child and leaving it to be emptied when he pleases is quite wrong. If the attention flags, or the infant drops off to sleep, the meal should be ended. He will then wake up ready for his next meal.

The contents of *an unfinished bottle* ought never to be reheated for use a second time.

Intervals.—During the first month a baby may be fed *two and a half hourly,* eight times daily, or, if a strong child, *three-hourly,* six times daily. During the next four months *three-hourly* feeds should be given six times a day, and thereafter *four-hourly* feeds five times a day. The important point is a long interval at night. It is nearly always possible to train an infant to go without food for a period of six hours if training is begun early. Convenient hours are :—

$2\frac{1}{2}$-hourly : 6.30 A.M., 9 A.M., 11.30 A.M., 2 P.M., 4.30 P.M., 7 P.M., 9.30 P.M., 12 P.M.
3-hourly : 6 A.M., 9 A.M., 12 noon, 3 P.M., 6 P.M., 10 P.M.
4-hourly : 6 A.M., 10 A.M., 2 P.M., 6 P.M., 10 P.M.

Quantities.—According to modern experience the most valuable guide in determining the food of an infant is its weight ; and nowadays its weight, not its age, is generally

regarded as the deciding factor. At the same time it must be clearly understood that the individual infant must be studied, and no rule is applicable to all infants. Speaking generally, the less active or the more above average weight the baby is, the less food it requires per pound body weight per day; whereas the more active or the more below average weight, the more food it needs. Again, less is required in warm than in cold weather.

A healthy baby fed on the breast gets $2\frac{1}{4}$ or $2\frac{1}{2}$ oz. of breast-milk per pound of its body weight in the day, and this fact will help us in fixing a standard. Thus, we shall not be far wrong if we say that the *fluid* required by a healthy infant in a day is $2\frac{1}{2}$ oz. multiplied by the number of pounds it weighs.

We have already discussed (p. 352) the principles on which cow's milk should be modified so that it most resembles breast-milk. It remains to select a simple formula. Observation of a large number of infants shows that, for each pound of body weight, an infant requires per day :— [1]

(*a*) *Cow's milk*, $1\frac{3}{4}$ oz., with $\frac{1}{2}$ drachm sugar ; or

(*b*) *Full-cream dried milk* (Glaxo, Cow and Gate, Ambrosia, &c.), 2 drachms, with $\frac{1}{2}$ drachm sugar ; or

(*c*) *Humanised dried milk* (Prescription Glaxo, Allenbury's No. 1 and 2, Humanised Trufood, &c.), $2\frac{1}{2}$ drachms, and no added sugar.

In each instance, of course, the quantity must be made up with *water* to give the child a total amount of fluid corresponding to $2\frac{1}{2}$ oz. for each pound body weight in the twenty-four hours. In the case of (*a*) and (*b*) one teaspoonful of *cod-liver oil emulsion* (50 *per cent*) should be given three times daily, before a feed and not mixed in the bottle. In the case of (*c*) also, small quantities of cod-liver oil emulsion should be used to replace any possible lack of vitamins if this method is used for any length of time.

When the baby reaches 15 lb. in weight (usually at the

[1] 'Modern Methods of Feeding in Infancy and Childhood,' by Donald Paterson and J. Forest Smith.

end of the sixth month), some form of *starch* may be added with care, first to one feed, then to two, then to three—*e.g.*, one heaped teaspoonful of either Patent Groats, Patent Barley, Allenbury's No. 3, or Glaxo Malted Food. Rusks, soaked in milk, should not be given except at meal times, and then only when the lower incisors have appeared.

It is sometimes useful, with a view to preventing gross over or under feeding, to calculate the **Calorie value** of the food. An infant requires each day between 40 and 45 calories per pound of body weight. There are about 20 calories in 1 oz. cow's milk; about 15 calories in 1 drachm sugar or centrifugal cream; and about 24 calories in 1 drachm cod-liver oil emulsion. Thus, if a baby weighing 10 lb. is being given eight feeds a day, each made up of 4 oz. milk, 2 oz. water, and a teaspoonful of cane sugar, it will be getting (assuming that the teaspoon holds 1 drachm sugar) $20 \times 4 \times 8$ calories in milk and $15 \times 1 \times 8$ calories in sugar, a total of 760 calories a day, whereas it only requires 45×10, or 450 calories a day. In other words, it is being overfed.

Diluents.—(*a*) *Water.*

(*b*) *Barley-water.*—Barley-water, if thick or not properly cooked, is a cause of much indigestion. It should be prepared as described on p. 50. It has a distinctly laxative effect, which may be useful in constipation, but in other cases may keep up a troublesome looseness of the bowels.

(*c*) *Alkaline Water.*—Milk is rendered more digestible by the addition of sodium bicarbonate or lime-water. One grain of bicarbonate is allowed to every ounce of milk. Lime-water is substituted for an equal amount of water in a milk-mixture in the proportion of from 1 to 6 oz. for every pint of milk. It has a slightly constipating effect.

(*d*) *Water and Citrate Solution.*—When sodium citrate is added to milk, clotting from rennin action is lessened or entirely checked. It is usual to allow 1 grain of citrate to each ounce of milk.

Each of the above modifications is an attempt to prevent

or reduce curd formation in the stomach, and to facilitate the passage of the milk into the intestine to undergo digestion there.

Condensed Milk.—Condensed milk is cow's milk evaporated down, by means of reduced pressure and more or less heat, to one-third its original volume. Cane-sugar is frequently added to the milk after condensation, in order to aid in its preservation. In many brands the milk has had its cream removed previously by a separator. There are thus three kinds of condensed milk : unsweetened condensed whole milk (such as Ideal and Hollandia) ; sweetened condensed whole milk (for example, Nestle's, Milkmaid, and Anglo-Swiss) ; and sweetened condensed skim-milk. The last is quite unsuited for a baby's nourishment.

(*a*) *Unsweetened condensed milk* has the disadvantage that it is apt to go bad when the tin is opened ; it should therefore be kept in a cool place, and a fresh tin opened daily. By punching two holes in the tin the contents can be poured out as required, without removing the lid and exposing the milk to the air. In diluting, it should be measured accurately in a graduated measure. When diluted with three times its bulk of water, a mixture more or less comparable to fresh cow's milk results. In the feeding of infants it must be further diluted in the early months, and cream and sugar added, as in the case of ordinary milk.

(*b*) *Sweetened condensed milk* has so much added sugar that, if it were mixed with only as much water as has been removed in condensation, the resulting fluid would be so sweet that one could hardly drink it. It must therefore be diluted with eight or more times its bulk of water to reduce the percentage of sugar, cream being added to supply the proper percentage of fat.

Uses.—Condensed milk, like dried milk, is useful when travelling, when good fresh milk cannot be obtained, and during hot weather ; in certain cases of marasmus, when fresh milk disagrees, it is well borne, especially if there has been vomiting.

The unsweetened variety is employed chiefly in the treatment of infantile diarrhœa when a large amount of cane-sugar would be harmful. It has the advantage over the sweetened variety that dilution is not required to counteract an excess of sugar, since none is added in the process of manufacture, but only to reduce a concentrated milk to its normal richness.

The sweetened brands are more generally used, and, being freely diluted, are digested and absorbed easily. Their use should not, however, be continued for more than a limited period, and the tendency to scurvy should be counteracted by means of fruit juice, the deficiency of fat made up by the addition of cream or by giving cod-liver oil emulsion, while extra protein can be added in the form of egg-albumin

Drawbacks.—Infants who are fed on condensed milk alone almost always become rickety ; they are anæmic, fat and flabby, and occasionally develop scurvy. They are liable to bronchitis and intestinal disorders, and show but little vital resistance. These evils apparently result from the deficiency of protein and fat in the dilutions given, and the relative excess of sugar. If the child is fed, as is often the case, on a very dilute mixture, starvation practically occurs. The means which may be adopted with a view to preventing these results have been already indicated.

Dried Milk.—Milk can also be preserved by desiccation after concentration *in vacuo,* either by passing it in a thin layer between two heated rapidly rotated cylinders in such a way that the water is immediately evaporated—*e.g.,* Glaxo—or by forcing it in an exceedingly fine spray into a drying chamber—*e.g.,* Trumilk. There results a fine powder containing all the original solids of the milk in a nearly sterile and soluble form. Dried milks may be regarded as incapable of infecting infants with tubercle bacilli.

Dried milk has been much used in recent years in the feeding of infants, being cleaner and more convenient than ordinary milk. Provided that the juice of oranges or

swedes is given, infants as a rule thrive on it; it is especially useful in hot weather.

Cylinder-dried milk has an agreeable taste, but unlike that of raw milk; its fat soon rises as a yellow layer of unemulsified oil on the surface; its curd is more flocculent and more finely divided than that of fresh milk, and is therefore more digestible. *Spray-dried milk*, if fresh, has the taste of raw milk, but it becomes cheesy if exposed to the air; the fat rises slowly like the cream of fresh milk, and its curd is practically identical with that of fresh milk.

Full cream dried milk, diluted in accordance with the directions on the tin, merely re-forms cow's milk, and in the opinion of many physicians should not be given to infants in this form, but should be humanised by the addition of water, sugar, and fat. Several dried milks (*humanised dried milks*) are now sold, which on the addition of 1 drachm of the powder to 1 oz. of water approximate closely to the composition of breast-milk.

"Humanising" with Whey.—Advantage may be taken of the fact that whey contains the lactalbumin of the milk, but not its casein. By mixing 8 parts of whey with 2 parts of cream, a fluid ("cream and whey") can be obtained which contains albumin and casein in the same proportion as in mother's milk.

Ashby's method.—Place 30 oz. milk in a Hawksley's steriliser, heat to 104° F., and add rennet. Break up the curd, and strain through muslin. Destroy the rennin by heating to 180° F. for twenty minutes, and then strain again. With the addition of 2 drachms milk-sugar to the pint, the whey may be used for newly-born infants. If 10 oz. milk is mixed with 20 oz. whey and ½ oz. milk-sugar, a weak "humanised" milk results. If a richer one is desired, "top" milk is used. The preparation of these mixtures, however, demands more time than a mother can usually afford.

Patent Foods.—Partly as a result of the claims made by the makers being in some cases devoid of foundation, and partly owing to the misuse of these foods, mortality among infants brought up on patent foods is high, although

some babies appear to take them without harm and even with benefit. Many contain an excessive amount of carbohydrates, often in the form of starch, and many are lamentably poor in fat, while a deficiency of protein is a common fault. Their prolonged use is frequently followed by the development of rickets and scurvy. Fortunately, their drawbacks are often largely overcome by their being given with fresh milk. Those foods which are more satisfactory in composition have the disadvantage of being expensive, while, since the child can generally be brought up on modified milk, their use is in most cases quite unnecessary. On occasions, however, certain of them prove useful when employed judiciously and with an intelligent appreciation of their composition and of the ages and conditions for which they are suitable.

It may be well here to explain what is meant by the term "malted." Grain starch is said to be malted when it has been converted into maltose by diastase, a ferment which is contained in the germinating grain; Mellin's food is thus prepared from wheat and barley, the insoluble starch being completely malted and converted into soluble carbohydrate. The value of maltose in infant feeding depends on the fact that it is less liable to ferment in the bowel than either lactose or cane-sugar.

The best known patent foods may be classified as under:—

(1) **Dried milk with malted starch added**—

(*a*) *Completely malted—e.g.*, Allenbury No. 2 Food, and Horlick's Malted Milk.

(*b*) *Partially malted—e.g.*, Milo Food, which is a mixture of desiccated Swiss milk, baked wheat flour, and cane-sugar; it contains some unaltered starch. Carnick's Soluble Food is similar, but contains pancreatic extract.

(2) **Malted Starch,** prepared from cereals (usually wheat), and requiring to be added to milk for use. It is composed principally of carbohydrates with some protein.

(*a*) *Completely malted—e.g.*, Mellin's, and Hovis Babies' Food. These contain no unaltered starch, and sometimes

are a useful means of supplying carbohydrate when lactose and cane-sugar do not suit.

(*b*) *Partially malted—e.g.*, Allenbury Malted Food and Savory & Moore's Food. These contain malt, the ferment of which converts most of the starch (but generally not all) into sugar when the food is mixed. Benger's Food similarly contains pancreatic ferment: it consists of cooked wheat flour and pancreatic extract; when prepared according to directions most of the starch is converted into soluble forms; the protein of the food is also partially digested as well as that of the milk used in mixing it; it is useful in feeding delicate and marasmic babies.

(3) **Unmalted Starch**—*e.g.*, Neave's, Ridge's, Robinson's Patent Barley and Groats, Scott's Oat Flour, Chapman's Flour, &c. Owing to the presence of much unaltered starch, foods belonging to this class should be avoided before the child has cut any teeth. Their addition to the diet later will provide the child with an increased amount of protein and carbohydrate, but rusks, bread-pap, oat-flour, and rice are as efficient and as easy of digestion, and also much cheaper.

Does the Diet Suit?

The points which require attention are whether the child retains the whole feed and is satisfied; whether there is evidence of indigestion, such as crying, sleeplessness, vomiting, or colic; the character of the stools; and, lastly, the weight from week to week.

1. **Crying.**—Digestive trouble is of course not the only cause of crying. Crying may be due to thirst in hot weather, discomfort—*e.g.*, through too tight clothing or pin-pricks, teething, and excessive acidity of the urine, causing scalding and frequency of micturition. In other cases it may indicate the onset of more serious illness, such as meningitis, bone or joint disease, &c.

Crying in connection with food is caused by—

(*a*) *The food being insufficient* in quality or quantity.—

In this case the crying usually occurs about half an hour before the next feed is due, and ceases after the feed. The cry of a hungry baby is a persistent whine.

(*b*) *The food being indigestible.*—The crying here occurs half an hour or more after the feed, and there are other signs of indigestion. Pain is shown by a paroxysmal piercing cry, and colic causes the baby to draw his legs up on the abdomen, and is relieved by the passage of flatus.

(*c*) *Excessive feeds, too rapid feeding, or wind.*—In this case it occurs directly after a feed, and may be accompanied by vomiting or regurgitation.

2. **Stools.**—The stools of infants fed on cow's milk are *normally* pale yellowish, homogeneous (that is, of the same composition throughout), and feebly alkaline, or faintly acid, to litmus paper. They number three or four daily during the first few weeks, afterwards one or two a day.

The motions do not become brown and formed until starchy food is taken. Certain drugs alter the colour, bismuth giving rise to dirty green or blackish motions, grey powder and calomel to green ones. Albumin water and whey produce thin brownish-yellow stools. Green stools are often due to hurried transit through the large bowel.

The nurse should keep close observation on the stools as regards their number, size, consistence, reaction to litmus paper, colour, and homogeneity, for such record is invaluable in determining which element of the food is disagreeing.

Constipated motions, which are acid and present a greasy appearance when broken down, are generally due to *excess of fat.* Large, pale, putty-like or semi-fluid motions, four or five daily, with an acid reaction, constituting the so-called "fat diarrhœa," are also due to excess of fat.

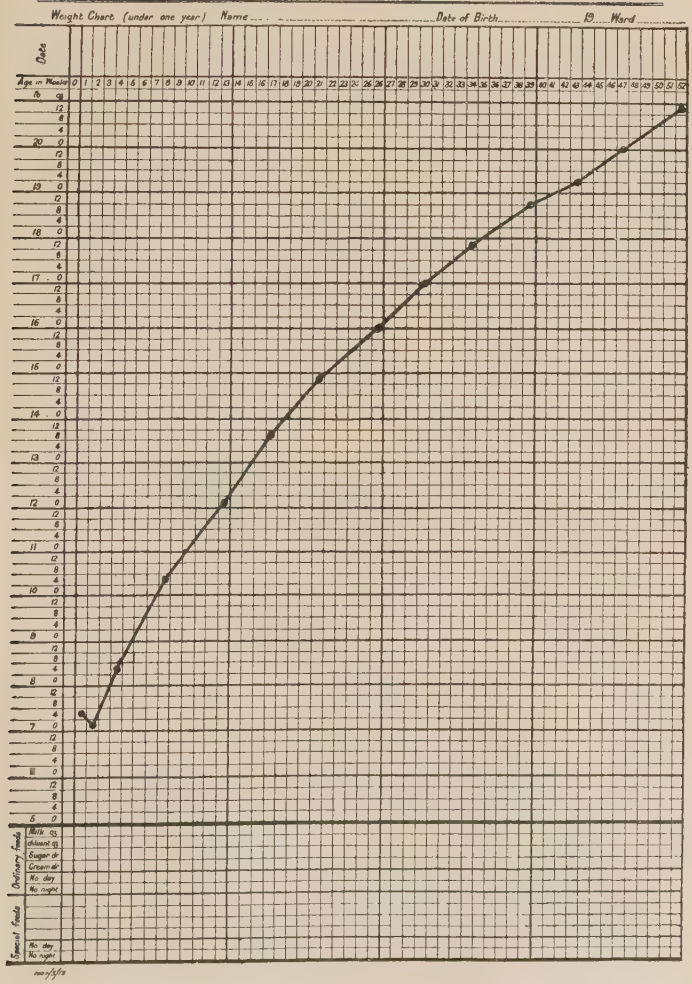
Constipated motions which are pale and crumbly are usually due to *excess of casein.* Protein decomposition is indicated by alkaline, putrid-smelling stools.

Frothy stools, very acid in reaction, show that *too much carbohydrate* is being given.

"*Curds,*" as the whitish masses sometimes seen in the

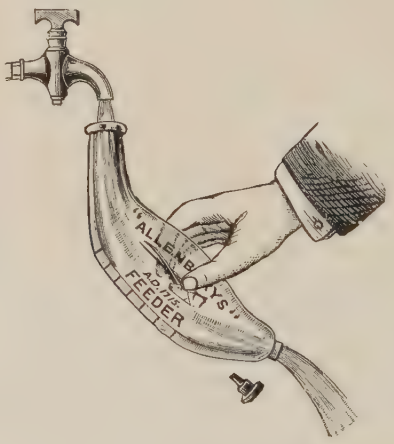
METROPOLITAN ASYLUMS BOARD.

QUEEN MARY'S HOSPITAL FOR CHILDREN.



Weight Chart.

yellow or greenish matrix of the stool are called, are rarely casein, and generally consist of soaps, fats, or mucus. They indicate that the child is unable to digest the mixture satisfactorily, either because the food is excessive or because its composition does not suit. The *casein curd* is generally firm, tough, and sinks in water; the *soap curd* consists of white granular seed-like particles; *undigested fat* appears as small flocculent irregular yellowish masses; while *mucus* often takes the form of balls. Unabsorbed fat can be differentiated from casein by the fact that it is soluble in equal parts of alcohol and ether.



Washing a boat-shaped bottle.

3. **Weight Curve.**—Regular weekly weighing is of the utmost importance, for it is a ready means of at once detecting that the child is not thriving satisfactorily. The baby should be weighed undressed at the same hour each week, conveniently just before being bathed. The weight should be recorded on a chart bearing the normal curve. For the first five or six months the normal weekly gain is 5 to 8 oz.; afterwards it is less.

V. Premature Children.

Duration of Pregnancy.—Labour usually commences forty weeks from the commencement of the last menstruation. The approximate date on which labour will commence may be ascertained by counting forward nine months from the last day of the last period and adding three days; delivery will probably take place a few days before or after this time.

The Premature Child is recognised by its weight and length being less than normal, and its voice and movements feeble; its skin is wrinkled and covered with downy hair (*lanugo*), and its nails may not reach to the tips of the fingers. Practically all those born before the end of the twenty-eighth week die. There is usually no difficulty in rearing those born after the thirty-sixth week. Between these two groups the proportion surviving increases with the number of weeks.

Management.—The important facts to remember are that the child has a low vitality; that, although it has difficulty in keeping its temperature at a normal level, it requires plenty of fresh air; and that it has difficulty in taking and digesting food.

Bathing.—Its eyes and nose having been cleansed after birth, it should be left in its cot for some hours. It should then be wiped all over with warm olive oil, and after being dried and weighed laid in its cot on its side. If less than $4\frac{1}{2}$ lb., it should be undressed and oiled every other day only. It should not be washed for several days.

Cot and clothing.—Incubators are now not recommended, and the body temperature is usually maintained by means of a suitable cot and clothing and hot-water bottles, the room being kept at 70° F. In a basket cot, lined with brown paper, is placed an enveloping blanket, on which are laid in succession a wool or hair mattress, a chaff mattress, a piece of blanket, a piece of india-rubber sheeting, and a piece of non-inflammable flannelette. The child, dressed in a gamgee jacket and petticoat, with woollen cap and

boots and covered with a soft shawl, has the enveloping blanket folded and pinned over it, and hot-water bottles are placed under the mattress and changed frequently. Its temperature should be taken in the rectum twice daily.

Feeding.—Infants over 3½ lb. should be fed eight times during the twenty-four hours (three-hourly by day and four-hourly by night); those under 3½ lb., ten times (two- and three-hourly respectively). Breast milk, of either the mother or a foster mother, is most desirable, and in many cases essential. If the infant is too weak to suck or to be lifted from its cot, the milk may be drawn off with a breast-pump, and given in a bottle with a specially small teat or by nasal tube. Paterson & Smith recommend as substitutes, in preference to peptonised milk, either diluted unsweetened condensed milk (*e.g.*, 1 oz. "Ideal" milk, 3 oz. water, 1 teaspoonful sugar) or "humanised" dried milk (*e.g.*, 1 teaspoonful "Prescription Glaxo" to 1 oz. water). The quantity needed is 2½ oz. for each pound of body-weight daily.

VI. The Nursing of Sick Children.

Nursing of Sick Children.—A young child cannot tell its nurse what is the matter. She must, by keen observation, be able to interpret the meaning of its different symptoms, without having them put into words as would be done by an older patient. These difficulties are in a measure overcome by that innate sympathy and liking which almost all women feel towards children, which help them to recognise a child's wants by its looks and inarticulate mutterings far more quickly than a man could. Often a nurse's patience is strained almost to the breaking-point by a child's wilfulness, but she must never give way. Reprove in a kindly manner of course she may, but she must never scold or threaten a child.

One thing which a nurse should always bear in mind is that a very trifling matter, such as a slight chill or a little indigestion, may produce the most alarming symptoms in a child, symptoms that the same causes would be power-

less to produce in an adult. On the other hand, a child, if it is much exhausted by disease or want of food, may present hardly any symptoms at all, though suffering from an acute illness such as pneumonia. In the first instance the indications are more urgent than they would be in the case of an adult; in the second instance the opposite holds good. This apparent contradiction is due to the extremely sensitive and excitable character of a healthy child's nervous system, in consequence of which it is easily upset by trifling ailments, so that it produces exaggerated symptoms; while, on the other hand, it is more quickly exhausted by illness and want of food, so that it then responds only feebly to the stimulus of disease.

Observation of Patient.—

(*a*) *Expression.*—If a child is in pain, it will always show it in its face. According to Dr Eustace Smith, "pain in the *head* is indicated by a contraction of the brow; in the *chest* by a sharpness of the nostrils; and in the *belly* by a drawing up of the upper lip." *Exhaustion,* which sometimes comes on very rapidly, especially after acute diarrhœa, is shown by depression of the anterior fontanelle in infants, by pallor of the face with cyanosis of the lips, and by sinking in of the eyes with incomplete closure of the lids during sleep, so that the white of the lower half of the eyeball is seen. Stimulants internally, and immersion for three or four minutes in a hot mustard bath, are the most efficient means of overcoming this condition.

(*b*) *Cry.*—Persistent crying in a young infant is likely to have a real cause and not be merely due to bad temper, as might be the case with an older child. It may be that it is too hot, or is being rendered uncomfortable by cold feet, a tight garment, a wet diaper, or the pressure of a safety-pin. If it comes on after a meal it is probably due to air that has been swallowed with the food, and which will often escape if the child is taken up and held in the erect position; otherwise, it will pass on into the intestine and perhaps give rise to colic. Removal of the diaper and gentle kneading of the abdomen will often relieve this latter condition. The character of a young child's cry

often gives as much information as the articulate speech of an adult. A child that is hungry gives vent to a prolonged passionate cry, after which it tries to extract nourishment from its fingers or thumbs, and failing to do so, cries again. With pain in the abdomen, we get a loud paroxysmal cry, accompanied by a drawing up of the legs ; with exhaustion a low whine. With meningitis we get at intervals sharp piercing screams, the child between whiles lying quietly on its back. When there is inflammation of the larynx, the cry is hoarse and whispering. With inflammation of the lungs a child as a rule cries but little, because of the pain which a deep breath causes it.

(*c*) *Posture in Bed.*—Healthy children, when sleeping, commonly lie on their sides ; when seriously ill or suffering from exhaustion, on the back with the face directed upwards. Drawing of the head backwards may be due to meningitis. Abdominal pain will cause a child to draw its legs up. This posture soon after a meal is a sure indication that food is the cause of the trouble.

To see if a child is losing flesh the inner side of its thighs should be examined. Acute diarrhœa will quickly make these parts soft and flabby to the touch, with wrinkling of the skin.

Bathing an Infant.—A baby should have a bath regularly each day. If he is strong he may have two, but if delicate, sponging should take the place of the second bath. In the case of young babies the temperature should be about 90° F. ; it should never be warmer than 95° F., and as he grows older may be reduced to 85° F. It is best, especially if the child is delicate, to use a bath thermometer. If this is not available, the elbow may be used to test the temperature.

The bath should be given in a part of the room free from draught, preferably in front of the fire protected by a screen, and the baby should not be in it more than five minutes. The nurse should wear a flannel apron, covered until the child has been dried by a soft towel fastened round the waist. The head and face are washed first, the baby lying

on the nurse's knee, and the nostrils are carefully cleansed with a little damp wool. The nurse then places her left hand and arm under his head and back, and, holding his legs with her right hand, lifts him into the bath. Keeping the left hand in position, she washes him with a soaped flannel. Very little soap should be used: the plain unscented kind usually serves quite well, but a delicate skin may require a super-fatted soap. On taking the child out she envelops him in the towel and pats him gently, thus drying the skin rapidly and thoroughly without rubbing. She then attends to all the creases of skin, especially behind the ears. Dusting powder (oxide of zinc, starch, and boracic acid) or fuller's earth is applied to the groin and other places where two surfaces of skin are in apposition. If there is a tendency to impetigo, cold cream or vaseline is better.

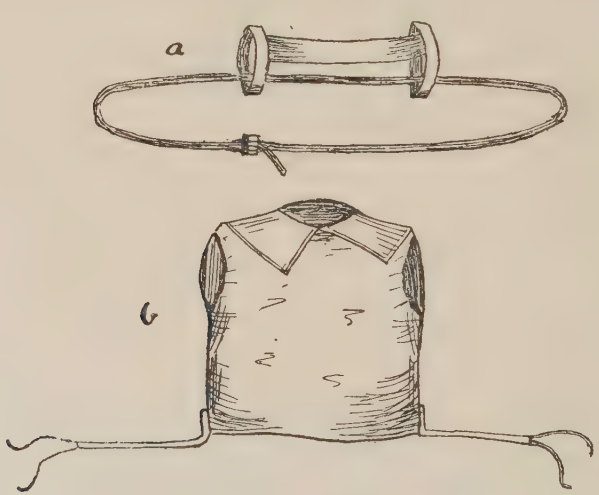
The vest and napkin are then put on. The binder is stitched, not pinned. The petticoat and gown are drawn up over the feet, and when all the garments are on the baby is turned on his face, and the tapes are tied. Finally, the mouth is wiped out with a piece of old linen, wrapped round the little finger, and dipped in water.

Hygiene.—All soiled linen should be removed at once. A wet diaper not only chills an infant and irritates the skin, but also lessens the purity of the air he is breathing. Warmth and fresh air are both indispensable. The windows must not be closed to keep a child warm, but warmth must be provided by means of a flannel nightgown, which completely covers the extremities, so that if he is restless and kicks off his bed-clothes, he will still be protected from cold. He should not be smothered in bed-clothes, otherwise he will get too hot, and throw them off with a risk of a chill.

Mechanical Restraint of Children.—It is often necessary to find some method of fastening a young child in its cot. If it is very ill, it must be prevented from sitting up; if convalescent, from standing up. To achieve the former object, the reins marked *a* are simple and effective. The loose band passes through the arm openings at the back of the child, and is fastened at each end to the side mattress

rail, or the two ends may be buckled together beneath the cot. The part which lies across the front of the chest can, if it happens to be too long, be temporarily shortened by a few stitches so as to fit the child.

For children who are able to sit up, the form of restrainer marked *b* is excellent, and it is both comfortable and easily put on or taken off. The vest fastens behind by a few buttons or tapes, while the lateral bands are tied to the mattress rail on each side. These pull against one another,



Restrainers for Babies.
(a) *When lying down;* (b) *when sitting up.*

so that no pressure on the chest is possible, and while a child can lie down or sit up as it pleases, it cannot raise itself off the bed.

Restrainers, however, unless properly used, may become highly dangerous. The bands which fix them to the mattress rail should never be slack, lest the child gets its head beneath them and is suffocated. On this account restrainers intended to keep a child lying down should never be used loosely tied in lieu of sitting-up restrainers.

VII. Disorders of the Digestive System.

1. **Diarrhœa.**—Diarrhœa in infants takes three forms clinically—simple diarrhœa, acute gastro-enteritis, and chronic diarrhœa. It is most prevalent about the period of dentition, and is especially frequent in the summer. Bottle-fed infants are very susceptible; over-feeding, especially with fats, and bacterial infection are common causes.

(*a*) *Simple diarrhœa* usually results from errors of diet, or from a chill. There is only moderate prostration and slight pyrexia; the motions, two to ten daily, are offensive and of a light brown or green colour, and undigested food is present. It usually lasts a few days only, but may pass into the severer type in the summer.

Warm clothing should be applied, and fluids freely given —*e.g.*, albumin water or whey, with sips of water frequently. Afterwards Mellin's Food made with barley water or peptonised milk may be used. If seen early a small dose of castor oil is useful; later a powder of bismuth or chalk is sometimes given. Lavage of the bowel is often a valuable method of treatment.

(*b*) *Acute gastro-enteritis*, or *summer diarrhœa*, is sudden in its onset; vomiting is usually persistent; the stools are numerous, at first fæcal, then watery and containing mucus. Prolapse of the rectum and excoriations around the anus are frequent. The legs are drawn up, and the abdomen hard; the temperature is usually 103° to 105°; wasting, exhaustion, and collapse are rapid; the child soon acquires a shrunken appearance, and the skin becomes lax and inelastic. To prevent spread to other children, the attendants should be most cleanly in their ways.

In the first twenty-four hours only frequent small doses of cold boiled water should be given; then albumin water. The acute stage rarely lasts more than two or three days, and children stand starvation well. If the skin is inelastic, sterile saline solution should be injected subcutaneously;

sometimes it is given intraperitoneally. The effect is immediate and very striking. Food should be increased with great care; whey, broth, Mellin's Food and barley water, and later milk, being gradually introduced. Brandy is often useful, and, if there is acute collapse, mustard baths may be employed. The vomiting may call for lavage of the stomach.

(*c*) *Chronic diarrhœa* may follow one of the acute forms, with progressive loss of weight. The child may die of exhaustion or broncho-pneumonia, or make a gradual convalescence. The treatment is similar to that of acute diarrhœa.

2. **Constipation** is less common than diarrhœa in artificially fed children; it is usually due to excess of protein and deficiency of fat. Cod-liver oil has a mildly laxative effect; one or two teaspoonsful of fluid magnesia may be added to the feed; a soap suppository is often useful. It is most important to establish at the earliest age the habit of a regular daily stool at a fixed time, preferably after breakfast.

3. **Vomiting.**—Persistent vomiting in infancy is generally due to one of four causes.

(*a*) *Overfilling of the Stomach.*—This is shown by the child regurgitating part of the meal after taking the bottle; it is easily remedied.

(*b*) *Indigestion.*—The vomiting occurs some little time after a meal, and the vomit consists of sour-smelling curd and mucus. It is usually accompanied by diarrhœa. In acute cases milk should be stopped, and the stomach washed out. In milder cases the milk should be alkalinised, citrated, or peptonised, and the amount of fat reduced. Dried or condensed milk is often useful.

(*c*) *Congenital hypertrophy of the pylorus,* or *pyloric stenosis,* is a rare condition. The vomiting dates from the first few weeks of life; it is persistent, is unaccompanied by signs of dyspepsia, and is often of a spouting character, gushing from the nostrils as well as the mouth. There is obstinate constipation. On examina-

tion, gastric peristalsis can be seen. Treatment is by operation.

(*d*) *Pyloric spasm* is more common, and is often difficult to relieve. Vomiting is urgent, and occurs many times a day; part or the whole of a feed may be ejected. There is no constipation, or visible gastric peristalsis. The spasm usually subsides under treatment. The infant, if not breast-fed, should be given a milk mixture alkalinised by sodium bicarbonate, or, if this fails, albumin water. The stomach ought to be washed out daily. Opium and belladonna are sometimes given

4. **Colic.**—See p. 273.

5. **Malnutrition** ranges from a slight fall in weight to serious atrophy. It is most often due to indigestion, but may be the result of tuberculosis or syphilis, or may be secondary to congenital heart disease or an overlooked empyema.

The indigestion may be the result of over-feeding or the use of unsuitable patent foods. Whey, milk (peptonised or citrated or diluted with lime water), or condensed or dried milk may be used until the digestion is restored.

On the other hand, malnutrition may be due to a lack of fat in a too weak milk-and-water mixture. Cream or cod-liver oil will remedy this, but care must be taken that too much is not given. It may also result from a deficiency in carbohydrates, especially about the ninth month; Mellin's Food may be given, or a little oat-flour may then be useful.

6. **Marasmus.**—In rare cases the infant is born with a very low vitality, and with an alimentary tract which is apparently incapable of dealing with any form of food. In the majority of marasmic babies, however, the cause is improper food and feeding. In such cases a wet nurse is the best line of treatment; if this is impossible a meat-juice and brandy mixture (brandy and fresh meat-juice 1 drachm each, water to 6 oz.) is recommended by Sutherland, 1 oz. every hour; followed after a few days by whey or peptonised milk. Or a white of egg and brandy mixture (white of egg 2 drachms, brandy and malt extract 1 drachm

each, water to 6 oz.) may be used. The child must be kept warm and clean, and must have plenty of fresh air. The results of treatment are very disappointing.

7. **Cœliac Disease.**—This disease is essentially a failure to absorb the fat of the food properly. The symptoms are commonly an excess of fat in the stools, enlargement of the abdomen, retardation of growth, loss of appetite, and some pyrexia. Apart from severe diarrhœa in the early years, the disease is not dangerous to life. The passage of colourless stools is the first symptom, appearing commonly at the end of the second year of life, occasionally earlier. In milder cases the stools may be formed and coloured. About the age of ten some improvement in the absorption of fat may occur. The *treatment*, which although not curative is generally very successful, consists in supplying a diet in which there is sufficient fat for growth, but not enough to cause the symptoms described. At first, butter, dripping, cream, meat fat, gravies, cod-liver oil, virol, &c., must be totally avoided. Any milk given should be thoroughly skimmed; Schweitzer's cocoatina, which is fat-free, should be substituted for cocoa. As the condition improves, an experimental test of giving more fat may be made, beginning with "scrapes" of butter or anchovy paste for breakfast every third day. If symptoms of disagreement, such as distension of the colon, loss of appetite, irritability, or foul stools, result, the fat should be again reduced.

8. **Intussusception** is the passing of one portion of intestine into another, the upper portion always passing into the lower. An irritation of the mucous membrane, such as an error in diet causing diarrhœa, is often the exciting factor. It is the usual cause of *acute obstruction* in children; 75 per cent of the cases occur under the age of one year; it is more common in boys than girls. There is intermittent abdominal pain, the infant drawing up its legs and crying during the spasms; vomiting occurs; there is constant straining to pass a stool, blood and mucus only being passed. A sausage-shaped tumour can be felt in the

abdomen. The treatment is immediate operation and reduction.

9. **Rectal Prolapse** may take the form of a ring of swollen mucous membrane, which protrudes through the anus when the child strains, or the whole thickness of the wall of the rectum may be involved to the extent of two inches or more, and it may remain constantly down. It is especially liable to happen in cases of rapid wasting, which lessens the support afforded to the rectum by the surrounding fat. The exciting cause is straining, and this is generally due to constipation, thread-worms, or diarrhœa. *Treatment* consists in washing the protruding bowel with cold water, and gently returning it by pressure upwards with an oiled rag. The child should pass his stools when lying on his side. Steps should be taken to remedy the cause, and make him fat as soon as is possible. If prolapse occurs apart from defæcation, he should be kept in bed with the buttocks strapped together.

10. **Intestinal Worms.**—(*a*) The *Threadworm* is common in children, in whom it may give rise to considerable disturbance. It lives in the colon, and by descending and passing out of the anus at night causes great discomfort and itching. The child is often fidgety, irritable, and restless at night. Threadworms can be detected in the stool as slender white threads, about half an inch long, and when freshly passed can be seen moving. The ova gain admission by the food, or by the child reinfecting itself by its fingers soiled in scratching the itching parts.

The treatment consists in the administration by mouth of castor-oil, or calomel and santonin, and by rectum of an enema of common salt (1 drachm to half a pint) or of infusion of quassia. Santonin gives the urine a bright yellow colour. For the anal discomfort a dilute mercurial ointment will be found useful.

(*b*) The *Roundworm* is found in both children and adults. It is white in colour, about 6 to 10 in. long, and resembles the ordinary earthworm. It inhabits the intestine, and may give rise to convulsions, gnashing of the teeth, and

abdominal pain. It is treated by the administration of santonin three times on alternate nights, with a purgative each morning.

(*c*) *Tapeworms*, which resemble long pieces of flat tape, inhabit the small intestine, and are 16 ft. or more in length. They are made up of more or less square segments joined together, each segment representing a single individual. The segment which adheres to the intestine is smaller than a match-end, and is called the "head," although it is not a head in the ordinary sense. The segments at the free thicker end are the more mature ones; these break off and are passed in the stool. As long as any segments remain, they will continue to multiply, so the evidence of success in treatment is the finding of the slender "head" in the stool. The motions must be carefully examined, therefore, to see if it is passed or not. If not, segments will appear again in about three months time.

The eggs have to pass through certain animals before they can infect man, and they thus result from the eating of imperfectly cooked flesh of infected pigs, oxen, or fish. The treatment consists in administering extract of male fern after purging and starving the patient for twenty-four hours.

VIII. Other Diseases of Children.

A description of the following disease of children will be found elsewhere on reference to the index: pericarditis, endocarditis, and chronic heart disease; laryngitis, bronchitis, broncho-pneumonia, acute pneumonia, pleurisy, and empyema; pulmonary tuberculosis; stomatitis, appendicitis, and peritonitis; nephritis, uræmia, calculus, tuberculosis of kidney, bladder and epididymis, pyelitis and cystitis; eczema, impetigo, psoriasis, ringworm, and scabies; meningitis, cerebral abscess and tumour, cerebral diplegia, hydrocephalus, poliomyelitis, spastic paraplegia, epilepsy, convulsions, tetany, chorea, and hysteria; rheumatic fever, Still's disease, rickets, scurvy, cretinism, and diabetes

mellitus; infectious diseases, syphilis, and gonorrhœa; eye, ear, nose, and throat diseases.

1. **Congenital Heart Disease.**—Congenital heart disease may be the result of either a defect in development or fœtal endocarditis. The usual abnormality in those children who survive birth is stenosis of the pulmonary valves. The condition gives rise to extreme cyanosis, and those affected are often described as "blue babies." Clubbing of the fingers, dyspnœa, and delayed growth are usual. These children rarely live beyond the age of twelve, dying of heart failure, lung complication, or tuberculosis. Treatment is limited to protecting them from colds and over-exertion.

2. **False Croup,** or **Laryngitis stridula,** is commonest between two and six. It is not a serious disease, but often gives rise to anxiety. The onset is sudden and almost always occurs during the night; the child wakes, frightened, with slight catarrh, a metallic cough, and loud croupy breathing; the cry is not affected; there may be some pyrexia. After an hour or two the child falls asleep, and breathing at once becomes easier. It differs from diphtheritic croup in its sudden onset and its less severe nature, as well as in the appearance of the throat. The treatment consists in applying poultices to the neck, and giving hot drinks; a warm bath is often useful.

3. **Laryngismus stridulus,** or **Child-Crowing,** occurs in rickety children, usually between six months and two years old. The immediate cause is usually some slight nervous shock. The attack consists of a very sudden arrest of breathing for a few seconds, following by a crowing inspiration. The body and limbs are rigid and the fists clenched; the face at first cyanotic, then pale. The attacks may recur several times in the same day. Tetany or convulsions are not uncommon in these children. The general treatment is that of rickets. A cold douche is often efficacious, given once or twice a day in front of a fire. Bromides are sometimes given.

4. **Habit Spasm,** or **Simple Tic,** is not uncommon in

both sexes between six years old and puberty, especially in those debilitated by illness or bad feeding, or suffering from mental strain. The jerking movements affect especially the face and head; blinking of the eyes, screwing up of the nose, shaking of the head, or shrugging of the shoulders are the commonest forms. The movements are usually diminished when the child is being watched, not increased as in chorea. Habit-spasm sometimes spreads by imitation. It may last for years. Treatment consists in stopping school attendance, avoiding all excitement, urging the patient to exercise self-control, and feeding with fattening food. Drugs are not of much use.

5. **Bad Habits.**—These include pica or dirt-eating, sucking the thumb, tongue, &c., biting the nails, head-rolling, head-banging, rocking and swaying movements of the body, and masturbation. All these habits consist of a morbid exaggeration of some unimportant normal action. The normal act causes little pleasure to the healthy child, while its morbid variation has a remarkable fascination for the children who practice it. They are more usual in children with other neurotic symptoms.

(*a*) *Pica.*—This is a craving to chew or eat such things as earth, cinders, wall-plaster, paper, or hair; it usually begins in early infancy. The child should be kept away from the substances for which he has the craving, his digestion and general health should be improved, and his mind kept busy and happy.

(*b*) The *Sucking* habit usually begins in early infancy also. In the case of the finger, paper splints may be applied to the arms so that the elbows cannot be bent; if left alone, the habit ceases when the child grows older. Sucking the tongue usually cannot be stopped until the child comes to years of discretion; it is very common among mongolian imbecile babies.

(*c*) *Rhythmical Movements*, as specified above, are most common among mentally defective or blind children. The movements should be at once checked, and the child made to run about or lie down whenever they begin.

(*d*) *Masturbation* consists in manipulation of the external genital organs in children of either sex; it may begin in infancy, but more commonly at school age. In young children it may take the form of rubbing the thighs together; it is often started by some local irritation. The treatment consists in removing any local irritation—*e.g.*, phimosis, hyperacidity of the urine, thread-worms, &c.; attending to the general health; taking effective means in young children to prevent the act by splintage; and getting the child's thoughts off the habit as much as possible. Bromides are sometimes given.

6. **Insanity,** in the ordinary sense, is very rare in childhood. *Melancholia* sometimes occurs after exhausting illnesses, such as enteric fever and influenza, or in the course of a chronic disease, such as valvular heart affection. *Mania* is occasionally associated with epilepsy, chorea, and hysteria. *Loss of moral control,* of a temporary nature, is occasionally seen in boys of neurotic stock; the child becomes lazy, untruthful, heedless, dirty, and unhappy. Treatment by a change in his surroundings and encouragement to improve is usually successful in curing this condition.

7. **Mongolism** is the name given to a class of mentally defective children whose features resemble those of the Mongolian races. About 5 per cent of all imbeciles belong to this class. The child's features are small, the head rounded, the palpebral fissures oblique, the outer canthus being higher than the inner. Nystagmus is not uncommon; adenoids are usually present; the tongue often protrudes from the mouth, and later becomes markedly fissured. Walking and speech are delayed, but the disposition is bright and affectionate, and the habits cleanly. These children are never sufficiently sensible to earn a living, and they are very liable to succumb to any acute disease; but few survive early childhood.

8. **Harelip** is a congenital malformation of the upper lip, which may be a mere indentation, or may extend into the nose. It may be single or double, and is frequently associ-

ated with cleft palate. Harelip is generally operated on during the first year of life, while the cleft in the palate is not closed until the patient is from three to five years old.

In cases of harelip the child should be carefully fed with a spoon for some days before operation. Very little should be put into the mouth at a time, the spoon being rested on the lower lip and not allowed to touch the upper, and the fluid allowed to run in very slowly, each mouthful being swallowed before the next is given.

9. **Cleft Palate** is a congenital defect of the mouth, allowing a communication between the nasal cavity and the mouth. The malformation may be *complete*, the alveolus and the whole length of the palate being cleft, with harelip also as a rule ; or *incomplete*, affecting the uvula and soft palate, or the uvula, soft palate, and part of the hard palate. The cleft follows the middle line except in the alveolus.

An infant with a cleft palate is often difficult to feed. Milk may be allowed to pass slowly into the hollow of the cheek from a spoon, or an ordinary boat-shaped bottle with a teat with the hole on its under surface may be used. The worst effect of the cleft is the interference with speech ; it is the soft palate which is so important in this connection. The hard palate can be remedied by obturators, but no instrument can replace the soft palate in articulation. Operation should be performed before the child has learned to talk.

10. **Spina bifida** is an imperfect development of the spinal canal, usually accompanied by protrusion of some of the spinal contents. It occurs once in a thousand births. There is generally a swelling over the spine, noticed at birth, with nerve symptoms, such as paralysis or a spastic condition of the lower limbs, and incontinence of urine and fæces. It is often associated with harelip or hydrocephalus. Sometimes there is no protrusion (occult spina bifida). The part should be protected to prevent ulceration ; sometimes operation is done to remove the sac.

11. **Thyroglossal Cyst** may develop in an unobliterated portion of the thyroglossal duct, which should have dis-

appeared at an early stage of fœtal life. It is noticed, usually before the age of ten, above or below the hyoid bone.

12. **Ectopia Vesicæ** (*Extroversion of bladder*) is a congenital defect. A rounded red swelling is found below the navel which is the posterior wall of the bladder. A groove on the dorsum of the penis represents the urethra (*epispadias*).

13. **Enuresis,** or incontinence of urine, is common in children of a nervous temperament. It may be due to lack of self-control, cystitis, irritation of the bladder by urine which is ammoniacal or contains excess of phosphates or uric acid, worms, adenoids, or chill. In treatment, any local disease should be corrected, the child should be wakened once or twice at night, and fluids given during the latter part of the day should be restricted. He should be encouraged to practise holding his water as long as he can during the day. Tincture of belladonna may be given, and electrical treatment by single-shock faradism is sometimes useful.

14. **Tuberculous Lymphadenitis** is more often met with in childhood than in later life, though it may occur at any age. It is most common in the neck, the tubercle bacillus passing through the mucous membranes into the lymphatics; the presence of enlarged tonsils, adenoids, eczema of the scalp, middle ear suppuration, and carious teeth greatly increases liability to the disease. The glands slowly enlarge, generally without pain, until softening and suppuration occur. The skin then becomes red, and the abscess bursts. The disease spreads slowly from one gland group to another, and may give rise to general tuberculosis. *Treatment* consists in attending to teeth and tonsils, placing the child in healthy surroundings in the fresh air and sunshine, and administering cod-liver oil. Locally, repeated applications of radium are useful. The operation of removal is done now less frequently than formerly, for recurrences after it are common.

Tuberculous disease is not uncommon in the bronchial and mesenteric glands; it also occurs in the axillary and inguinal glands.

15. **Non-tuberculous Glandular Enlargement.**—Enlargement may be due to (*a*) *Simple Acute Adenitis,* which may subside or form an abscess. It is generally secondary to sepsis in the neighbourhood of the glands. (*b*) *Simple Chronic Adenitis,* due to long-continued absorption of infective material from enlarged tonsils and adenoids, carious teeth, and impetigo of the scalp. It clears up when the cause is removed. (*c*) *Lymphadenoma* (Hodgkin's disease), in which the glands remain separate and do not soften. Gradually the glands in all parts of the body become affected, the child wastes and becomes anæmic, eventually dying. Arsenic is the drug usually given. (*d*) *Lymphosarcoma,* a rapidly growing, painful, malignant tumour of the glands. (*e*) *Congenital Syphilis* may cause enlargement of the glands, which may be mistaken for tuberculosis.

16. **Caries of the Teeth** usually begins in early life, only one in twenty-two school children having healthy teeth. Carious teeth not only lead to toothache, neuralgia, chronic indigestion, and malnutrition, but the chronic septic absorption from them may cause prolonged anæmia and severe joint pains.

Causes are mainly two: (1) *Defective formation of the enamel,* due to a lowering of the general metabolism. Transverse bands of defective enamel are often found to correspond with periods of illness which occurred at the time when that particular level of enamel was forming under the gum; thus poor health favours dental caries. Deficiency of Vitamin A, found in butter and cod-liver oil, has the same effect.

(2) *The action of bacteria on the dentine after the enamel has been removed by acids formed in the mouth.* Thus, feeding the child on soft food with too much sugar in it leads to decay. Abnormality in the position of the teeth assists. Milk puddings, bread and jam, and all sugar articles of diet should, if possible, be followed by fresh fruit. Chewing a ripe apple efficiently scours the teeth. Tooth-brushes and powders are less effective, but keep

the teeth white. Antiseptics are disappointing, but the mouth should be rinsed out with water after each meal, as well as night and morning. Medicines containing mineral acid or iron may be taken through a glass tube, but the best thing is to wash the mouth out thoroughly after the medicine is taken.

After tooth extraction some attempt should be made to keep the mouth clean for the first few days by the use of antiseptic mouth-washes. If bleeding does not stop, it is necessary to turn the clot out of the tooth socket, syringe it with hydrogen peroxide, and plug from the bottom with wool soaked in some styptic. A pad of folded lint is placed on the top of the plug, and a jaw bandage applied. A diet of milk and soups is needed after extensive extraction.

Grinding of the teeth during sleep is a sign of nervous irritation, and may result from injudicious feeding, worms, or too much excitement. The prominent teeth, especially the canines, look as if a file had been used.

17. **Sore Buttocks.**—An infant's buttocks are apt to get red and sore if wet and dirty napkins are not changed frequently, and if the skin is not dried and powered carefully after wetting, and washed after soiling. Not infrequently the region covered by the napkin is the site of acute erythema, set up by ammonia given off by the urine. The calves and heels are sometimes also affected, and in boys the end of the prepuce. In these cases the wet napkin emits a strong smell of ammonia, although the urine of these children has no such odour when passed into a vessel. It is generally due to the alkaline condition of the napkins, resulting from their having been washed with strongly alkaline soap and not properly rinsed out afterwards with clean water. It may also arise from alkaline stools. *Treatment* consists in carefully washing and frequently changing the napkins ; and in washing the affected skin repeatedly with warm water and applying vaseline. The child's digestion should be attended to.

18. **Nævus.**—*Superficial nævi* ("mother's marks") often disappear naturally, but if growing or in a prominent

place require to be destroyed by caustic or cautery. Carbon-dioxide snow is used, or radium may be employed, a small portion of the nævus being done at a time. A *subcutaneous nævus* may be sloughed off by ligatures inserted through the base by means of a needle ; or an attempt may be made to coagulate the blood in it by electrolysis ; or both the methods, sloughing and coagulation, may be combined by using the Paquelin cautery or galvano-cautery. Electrolysis consists in passing a constant current through needles (insulated with the exception of about $\frac{1}{4}$ in. at the end) inserted into the nævus. The current is passed until the swelling becomes white and hard ; it is then reversed for a short time to prevent hæmorrhage. Small subcutaneous encapsulated nævi may be dissected out. Bleeding sometimes occurs and is stopped by pressure.

19. **Congenital Hernia.**—A natural cure in *Inguinal Hernia* is only possible during the first three months of life, during which time the infant should wear a small worsted truss day and night, and every care should be taken that no cause of excessive straining exists, such as constipation, cough, or excessive crying. The *worsted truss* is an efficient appliance during the first six months of life, provided that it is not removed while the child is crying, that when it is changed the child is lying down, and that while it is out of position pressure with thumb or finger is kept up over the external ring. *Method* : a half skein of four-ply white Berlin wool is used. The child lies on its back and the hernia is reduced. The skein is hooked round the thumb, the tip of which is placed over the ring to keep the hernia in ; the other end of the skein is passed round the side on which the hernia exists, underneath the back, and across the front of the body to where the thumb is resting over the ring. The free end of the skein is now passed through the loop which is being held in position by the thumb, and the bunch of wool produced by the looping is carefully adjusted over the ring, the thumb being removed when this is completed. The free end is then passed under the leg, and fastened to the circular band at the back.

From the age of six months to two years a *rubber truss* is better. Most cases are operated on (p. 546).

An *Umbilical Hernia* is usually treated with a pad attached to a rubber belt.

TABLE OF WEIGHT, HEIGHT AND CHEST MEASUREMENT OF CHILDREN (HOLT).

Age.	Weight in Pounds.		Height in Inches.		Circumference of Chest in Inches.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
Birth	7.55	7.16	20.6	20.5	13.4	13.0
6 months	16.0	15.5	25.4	25.0	16.5	16.1
12 "	20.5	19.8	29.0	28.7	18.0	17.4
18 "	22.8	22.0	30.0	29.7	18.5	18.0
2 years	26.5	25.5	32.5	32.5	19.0	18.5
3 "	31.2	30.0	35.0	35.0	20.1	19.8
4 "	35.0	34.0	38.0	38.0	20.7	20.5
5 "	41.2	39.8	41.7	41.4	21.5	21.0
6 "	45.1	43.8	44.1	43.6	23.2	22.8
7 "	49.5	48.0	46.2	45.9	23.7	23.3
8 "	54.5	52.9	48.2	48 0	24.4	23.8
9 "	60.0	57.5	50.1	49.6	25.1	24.5
10 "	66.6	64.1	52.2	51.8	25.8	24.7
11 "	72.4	70.3	54.0	53.8	26.4	25.8
12 "	79.8	81.4	55.8	57.1	27.0	26.8
13 "	88.3	91.2	58.2	58.7	27.7	28.0
14 "	99.3	100.3	61.0	60.3	28.8	29.2
15 "	110.8	108.4	63.3	61.4	30.0	30.3
16 "	123.7	113.0	65.6	61.7	31.2	30.8

PART V.—FEVERS AND FEVER NURSING.

CHAPTER XXII.

GENERAL FEATURES AND MANAGEMENT OF FEVER CASES.

I. Infection.

The Germ Theory of Infection assumes that in all infective diseases the infecting virus is a *micro-organism*—*e.g.*, bacilli, micrococci, spirilla, &c. A *specific infective disease* is one which is produced by one particular variety of organism and no other—for example, diphtheria, typhoid fever, syphilis, &c. Conditions such as suppuration, which may be caused by a number of different bacteria, are thus *non-specific infections*. Some diseases—*e.g.*, scarlet fever and mumps—are communicable only between human beings, while others may be transmitted to man from animals. Among the latter are tubercle (from cows), plague (from rats), anthrax (from cattle), hydrophobia (from dogs), and glanders (from horses).

Sources of Infection and Spread.—(1) **Patients.**—In each disease the micro-organisms multiply enormously in those mucous and epithelial tissues which are most affected by them, and the infection is largely cast off from the body with the secretions of these parts. It thus comes about that these secretions form the principal source of

infection. Transmission of these secretions, with the germs which they contain, may take place—(*a*) *directly*, by contact, or by sneezing, coughing, or loud talking ("droplet infection"); or (*b*) *indirectly*, by things polluted by them, particularly the hands and articles of food.

The secretions from the mucous membranes of the patient's mouth, throat, and nose are intimately concerned in the spread of *scarlet fever*, *measles*, *diphtheria*, *whooping-cough*, and *mumps*. In *smallpox*, on the other hand, the fluid of the vesicles and the scabs which follow are the main source of infection. In *enteric fever* the bacillus typhosus abounds in the fæces and the urine; hence the special need for changing the sheets of these patients even when only slightly soiled. The sputum in *pulmonary tuberculosis* continues to contain highly virulent germs when dry, and since the latter are then readily blown about, it is thus more dangerous in this condition. A knowledge of these facts is essential if the nurse is to adopt adequate precautions against infection.

The *hands*, once infected, may readily convey infection to the mouth, and they are probably the most frequent means of its transmission. It was formerly thought that infection remained for long periods in *fomites* (clothes, bedding, curtains, &c.), but less importance is attached to them nowadays, for it is believed that few infective microbes retain their vitality and virulence for long outside the body. Sewage-polluted *water* has not infrequently given rise to epidemics of typhoid and paratyphoid fevers, cholera, and diarrhœa. Infected *milk* also has been shown to be an occasional cause of outbreaks of typhoid and scarlet fevers, and of diphtheria.

While doing her utmost to help the patient safely through his illness, the nurse must never forget that the slightest carelessness on her part may result in others catching the disease. It is clearly her duty to guard herself by all reasonable *precautions against infection*; for example, she should keep her finger-nails short, use the nail-brush before meals, not go on duty fasting, keep her mouth closed while

her patient coughs, and get all the fresh air she can. She should not, of course, put herself first, and be careful to the verge of fearfulness for her own safety. That is a fault with which nurses can very seldom be charged, and much more often one has to blame them for not taking enough care of themselves, which is in itself a serious error. Those who are careless about themselves are apt to be the same about other people, and hence are more likely to carry contagion away with them from the sickroom.

(2) **Carriers.**—It is now recognised that certain infections are not infrequently spread by "carriers"—*i.e.*, persons who, while showing no symptoms of the disease, carry and transmit the infecting organisms. These diseases are typhoid and paratyphoid fevers, diphtheria, and scarlet fever, and probably also dysentery, influenza, tuberculosis, plague, and the infective nervous diseases, such as cerebro-spinal fever, encephalitis lethargica (sleepy sickness), and acute poliomyelitis.

There are three classes of carriers—(*a*) *the contact carrier*, who has been in contact with an infectious disease, and who usually throws off the infection in a short time; (*b*) *the convalescent carrier*, who continues to harbour during convalescence the organisms which caused the disease; and (*c*) *the chronic carrier*, who is a great source of danger, for he harbours infective organisms for long periods, and it is often difficult, or even impossible, to free him from infection.

(3) **Animals.**—Milk from cows infected with tubercle is a frequent source of *tuberculosis* in man, the bovine type of tubercle bacillus being found in over 40 per cent of abdominal, glandular, and joint tuberculosis under the age of five. It is believed that *ringworm* is sometimes derived from cats. *Glanders* is occasionally acquired by ostlers from infected horses, and *anthrax* (wool-sorter's disease) from infected wool or hides.

(4) **Insects.**—The *house-fly* is an active agent in the infection of food, and may in this way transmit typhoid, cholera, summer diarrhœa, and dysentery. In Egypt

especially it not infrequently carries eye infection. Certain varieties of *mosquito* have been definitely proved to be the means of conveying the malarial parasite, and the infection of yellow fever, from one person to another. The *fleas* of the rat are intermediaries of bubonic plague between plague-infected rats and men. *Lice* transmit typhus, relapsing fever, and trench fever, particularly if their bodies are rubbed into abrasions by scratching.

II. Bacteriology and Immunity.

It is necessary that the nurse, if she is to obtain a clear understanding of the principles which govern limitation of infection, should study carefully Chapters XIII. and XIV., particularly as regards immunity, natural and artificial, and vaccines and anti-sera.

III. Fever and the Febrile State.

Regulation of the Body Heat.—The heat of the body is produced by the oxidation of the tissues generally —*e.g.*, in the liver and other glands, in the heart and other involuntary muscles, and in the voluntary muscles and brain during their work. It is given off from the body, partly by radiation and conduction, and partly by expired air and the evaporation of sweat. A certain amount also is lost in the fæces and urine. In health the temperature is maintained at about 98.4° F. by the heat-regulating mechanism of the nervous system. Thus in hot weather or during heavy work when heat is produced by the muscles in large amount, the respirations are deeper and more frequent, and the body is cooled by the evaporation of an increased amount of sweat. When the weather is cold, on the other hand, the vessels of the skin contract, sweat is lessened, and one is stimulated to more exertion. When the heat-regulating mechanism is deranged, as by the

toxins of an infecting organism, the body temperature rises and *fever* results.

Symptoms of Fever.—Fever is more than a mere elevation of temperature or pyrexia. It implies also increased tissue waste, acceleration of pulse and respiration, disturbances of the digestive system (furred tongue, diminished saliva, impaired digestion, loss of appetite, thirst, and constipation), scanty and high-coloured urine, a feeling of chilliness, diffused soreness or pains, frequently headache and insomnia, and in some cases delirium. Rigors may also occur.

Pyrexia.—The varieties are described on p. 100.

Insomnia.—See p. 323.

Delirium is a transitory mental disorder which occurs in many diseases. There are two main types, the febrile and the afrebile. In addition, there is *delirium tremens*, which has special characters, and is dealt with separately (p. 321). Delirium may occur in neurotic or alcoholic individuals even though the disease causing it is mild. It arises in children much more readily than in adults.

(*a*) *Febrile delirium* occurs in the course of the exanthemata, especially typhoid fever, and in other acute diseases, such as pneumonia, influenza, septicæmia, and acute rheumatism. It begins with insomnia and restlessness; the patient becomes unable to understand what is said to him, and mutters in a disconnected way. He may develop *illusions* regarding the persons present, the objects in the room, &c., and may also have *hallucinations*, seeing and hearing imaginary things, and often showing evidence of terror. He may try to get out of bed, and in severe cases blindly attack those about him. The *treatment* consists in protecting him from injury, getting him to take sufficient nourishment, and lowering the temperature by cold baths or wet packs.

(*b*) *Afebrile delirium* occurs in the convalescent stage of acute infections, and after hæmorrhage and other exhausting conditions; belladonna may also produce delirium. Afebrile delirium presents the same features as the febrile

form, but most cases recover rapidly. The *treatment* consists in maintaining the patient's strength; liquid food should be administered frequently; prolonged warm baths are useful, and hypnotics (paraldehyde, sulphonal or trional) are given.

Rigors are due to the absorption of toxins. They may occur at the onset of an acute illness—*e.g.*, acute pneumonia or a malarial attack; or in the course of an illness, in which case they often indicate suppuration. A rigor usually lasts about twenty minutes, and typically has three stages—cold, hot, and sweating. In the *cold stage* the patient is pale, and shivering may be so violent as to shake the bed, and the temperature may rise to 104° or 105° F. In the *hot stage* the patient is flushed and thirsty, and suffers from severe headache. In the *sweating stage*, which sometimes does not occur, there is profuse perspiration, and the temperature falls rapidly; it is often followed by collapse. Hot blankets and bottles should be used in the cold stage, the bottles being taken away at the onset of the hot stage. Hot sponging may be needed later to remove the sweat.

Fevers (*acute infectious diseases*), besides being due to an infective virus, are characterised by the fact that their course may be divided into the following stages:—

(1) *Incubation*, lasting from the moment of infection to the onset of the first symptoms.

(2) *Invasion*, or *prodromal period*, from the first symptom till the rash appears, or, in the case of a non-eruptive fever, till the temperature reaches its acme.

(3) *Fastigium*, the stage of full development, which may be as short as one day or last for many weeks.

(4) *Defervescence*, the stage of termination, which may be by "crisis," the normal being reached in twelve to forty-eight hours, or by "lysis," the pyrexia only gradually subsiding.

(5) *Convalescence*, during which strength is regained and lost weight made up.

IV. The Principles of Prevention.

Experience, as already pointed out, has emphasised the importance of close proximity and personal contact in the transmission of specific diseases from the sick to the healthy, hence the advisability of *isolating* the infectious sick. In order that the Health Authorities may take steps to secure effective isolation and be in a position to adopt the other measures necessary for the prevention of spread of an infectious disease ("prophylaxis"), *notification* to them of all cases is a necessary preliminary.

Notification.—Every medical practitioner attending on a patient suffering from the diseases specified in the Infectious Diseases (Notification) Act, 1889, is required to send a certificate to that effect to the Medical Officer of Health. This duty is cast upon the head of the patient's family or the nearest relative or those in attendance upon the patient, but it is usually performed by a medical practitioner. The diseases enumerated in the Act are—

Smallpox,	Erysipelas,	Relapsing Fever,
Cholera,	Scarlet Fever,	Continued Fever,
Diphtheria,	Typhus Fever,	Puerperal Fever;
Membranous Croup,	Typhoid Fever,	

but any other disease can be added by the Health Authority, such as chicken-pox, which is commonly made notifiable when cases of smallpox occur, in view of the possibility of mild cases of the latter being regarded as chicken-pox. In some localities measles and whooping cough also are notifiable.

Certain other diseases are notifiable by the medical attendant under the Regulations made by the Ministry of Health; these include—

Plague,	Tuberculosis (all forms),
Dysentery,	Anterior Poliomyelitis,
Trench Fever,	Encephalitis Lethargica,
Primary Pneumonia,	Cerebro-spinal Fever,
Influenzal Pneumonia,	Ophthalmia Neonatorum.

The Regulations of the Home Office also require notification of certain diseases when acquired in industrial occupations; such diseases include anthrax, lead-poisoning, phosphorus poisoning, &c.

On receipt of a notification of an infectious disease, the Health Authorities visit the house, secure the efficient *isolation of the patient*, endeavour to ascertain the source of infection, and take such other measures as are necessary to prevent spread of the disease—*e.g.*, the placing in *quarantine of "contacts"* where advisable, the *disinfection* of articles which have been exposed to infection, &c.

Quarantine of Contacts.—When an outbreak of infectious disease occurs in an institution, such as a hospital, school, or barracks, it is usual to place the contacts in quarantine—*i.e.*, to isolate them for a certain period from all susceptible persons who have not been exposed to infection. The period, as the name implies, was originally 40 days, but now it is limited to the maximum period required for the development of definite symptoms of the particular disease—viz., scarlet fever, 7 days; smallpox, 15 days; rubella, measles, chicken-pox, and whooping-cough, 21 days; mumps, 26 days. Diphtheria contacts are released from quarantine when negative cultures have been taken from nose and throat on two or three successive days. It is seldom necessary to quarantine typhoid fever contacts, but they should be kept under observation for three weeks.

V. Isolation.

A. **Home Isolation.**—The patient is isolated in one room, preferably at the end of a corridor, and without carpet or needless furniture. The door is kept shut, and ventilation secured by open window and fire. Doctor and nurse wear overalls, hanging these up and washing their hands when leaving the room. Vomit, urine, &c., are received into vessels containing a disinfectant, and emptied down the w.c. Soiled swabs are burnt at once. The nurse cleans the room herself, sweeping it daily with damp tea-leaves and

burning the sweepings. Feeding utensils are washed in the room. The milk-jug may be stood outside the window.

B. **Hospital Isolation** is of three kinds, dependent on the type of wards available.—(1) *The Segregation Hospital.* Wards of from twelve to twenty or more beds are provided for scarlet-fever patients, similar wards for diphtheria patients, &c.; smaller wards for combined diseases; and single-bedded rooms, usually inadequate in number, for doubtful or complicated cases requiring complete isolation.

(2) *The Cubicle Isolation Hospital.*—In each ward is a central passage with single-bedded cubicles opening into it, separated from one another by partitions, 7 ft. high, composed in great part of glass. Each room is well ventilated, and provided with its own hot and cold-water fittings for hand-basin and movable bath. All articles used by the patient, such as cups, plates, spoons, &c., are sterilised after use, and the nurses wash their hands and change overalls on going from one cubicle to another. In this way it is found possible to treat different diseases in adjacent cubicles without transfer of infection.

(3) The third form of hospital isolation is that known as *Barrier Nursing* or *Bed Isolation,* in which the patient is retained in a general ward. If he is a doubtful case of scarlet fever, or if he has scarlet fever and whooping-cough, he is placed in a scarlet fever ward and guarded by means of special precautions. In some hospitals a tape is placed between uprights at the foot of the bed; this constitutes the barrier, and is a warning to everybody who approaches the bed that the patient in it is being isolated. In other hospitals no barrier is used, and the system is then spoken of as "bed isolation."

These methods are intended to guard against the direct conveyance of infection to or from a patient. If a patient who has not scarlet fever is nursed in a large ward with a number of patients suffering from that disease, unless he is very insusceptible he can only be protected by thorough ventilation and by the greatest care on the part of those who attend him, both medical officers and nurses. The

precautions taken vary slightly in different hospitals, but in essence they are the same for barrier nursing as for cubicle nursing. The fever nurse working under these conditions must keep before her the same ideal as the modern surgical nurse. She must endeavour to be medically aseptic. With this end in view she puts on a special overall which hangs beside or at the foot of the bed of each patient who is isolated in a general ward or inside a cubicle. If she is going to do anything for the patient beyond arranging his bed-clothes, she thoroughly cleanses her hands before touching him, and again when she has finished what she had to do. After syringing the throat or cleansing the ear, or wiping any discharge from the nose, she most carefully scrubs her hands, taking care to keep the nails cut short. If a nurse once comprehends that there is more danger to a patient from the direct conveyance of infection to him by his nurses and doctors than there is from the air, she will recognise the necessity for strict observance of all rules which aim at the promotion of medical asepsis.

The same principle is carried out in regard to feeding utensils and instruments which are sterilised, and books, toys, and newspapers, which are not allowed to pass from one patient to another.

There is considerable difference of opinion as regards the respective merits of the methods of isolation that have been briefly described in the preceding paragraphs ; but very few medical men are at present willing to believe that the risk of air-borne infection can safely be neglected and attention be paid alone to the personal factors. It must at any rate be obvious that the most conscientious nursing is required to permit of bed isolation being attempted without the risk of disastrous failure.

VI. Disinfection.

Nurses should understand clearly the difference between disinfectants and deodorants. A *disinfectant* is something

that "frees from infection"—*i.e.*, if used in sufficient strength it kills the contagious element. A *deodorant*, on the other hand, merely "frees from smell"—*i.e.*, it hides the odour, but does not necessarily destroy the cause of it, though some deodorants are also disinfectants. Carbolic acid is a disinfectant, eau-de-Cologne a deodorant. The risk attached to the use of deodorants is that some people are quite satisfied when they have hidden a smell, instead of finding out and removing the source of it.

Heat is the only absolutely reliable disinfectant, and is used in the form of *steam* (for mattresses, pillows, blankets, and clothing), *boiling* (for bed- and body-linen), and *burning* (for rags and articles of little or no value). Stains, especially those of an albuminous nature (blood, fæces), are liable to become fixed if the fabric is heated, but these can always be removed prior to disinfection by soaking and rubbing in cold water.

For things that cannot very well be subjected to the action of heat we have to use **chemical disinfectants,** called "germicides," or germ-killers. These are much less satisfactory than heat. Among the best are carbolic acid, 1 in 20, and perchloride of mercury, 1 in 1000. If used in weaker solutions than these, they cannot be relied upon to kill germs except after prolonged action. Another efficient, but more expensive, disinfectant, is formalin, 1 in 100. Milk of lime and chloride of lime are useful for disinfecting stools. Other germicides are described on p. 509.

Furs and *books* are usually disinfected by formalin vapour (see p. 401); *leather goods* are wiped with cloths soaked in formalin; *indiarubber goods* are boiled or wiped with perchloride solution.

1. **Air of Room.**—Attempts to disinfect the air of the sickroom by means of carbolic sprays, or by standing dishes of the same lotion about the apartment, are absolutely useless. These act to a certain extent as deodorants, but have no other action. A sheet kept constantly wet with 1 in 100 carbolic or izal lotion is often hung over the door of an infectious patient's room in private houses

As long as it is wet it arrests dust and germs, which might tend to be blown from the sickroom into the house. Its presence also serves as a warning to all. A small fire is a useful aid to *ventilation*, which is really the only method of purifying the air of the sickroom.

2. **Linen of Patient.**—In a general hospital this goes to the disinfector on its way to the laundry. In a private house both the body and bed-linen after use should be placed in a disinfectant solution—*e.g.*, izal or lysol (1 in 100). A foot-bath is a convenient receptacle, as a large quantity of the disinfectant is needed. It should stand in an adjacent apartment.

As regards the *final cleansing* of these articles, they should, if possible, be washed at home, or, if that is not practicable, they should be placed in boiling water for ten minutes before being sent out of the house. This can usually be managed by means of a large stock-pot. If there is a steam disinfecting station near, the patient's linen should pass through that before going to the public laundry.

If there is no convenience at home for washing or boiling the linen, and no disinfecting station to send it to, it should be allowed to soak for at least twelve hours in the disinfecting solution before going to the laundry. It should then be tied up in a clean sheet, having been kept in the disinfectant till the time comes for it to be fetched.

Especial care is needed in the treatment of soiled linen from cases of *enteric fever*. If very dirty, it should first be rinsed in plain water, being well pressed and stirred about with a stout stick to remove as much of the excretal matter as possible before placing it in the bath with the other articles. A nurse should never omit to wash her hands immediately after she has handled soiled linen.

3. **Excreta.**—It is unnecessary to attempt the disinfection of *enteric excreta*, except when they pass from the house into a cesspool, as is usually the case in the country. If there is a main drainage system, there should be no danger in emptying the untreated stool down the w.c., the

seat of which, if fixed, should be carefully wiped each time with a cloth soaked in a disinfectant.

Should disinfection be considered desirable, the *stool* should stand for an hour mixed with an equal bulk of corrosive sublimate (1 in 500), or carbolic acid. Before a bed-pan is given to the patient a small quantity of disinfectant may be put in it, the handle having been previously firmly plugged with a rubber cork or carbolised tow. After use it is covered up and at once removed from the room. Where there is not a main drainage system, the best method for disposing of an enteric stool is to mix it thoroughly with about a cupful of commercial unslaked lime and a little hot water. Enough heat is generated to kill the typhoid organisms, and it can afterwards be buried.

The *urine*, if its ultimate destination is a cesspool, should be mixed with an equal bulk of a disinfectant solution, and also allowed to stand for an hour before being emptied away. Especial care should be taken in dealing with this excretion, as in the later stages of enteric it may be loaded with the germs of the disease.

4. **Sputum.**—Some izal, sanitas, or chloros solution should be placed in the cup before use, more with a view to preventing the sputum adhering to the sides and bottom of the vessel than with the idea of disinfection, since germicidal solutions are quite unable to penetrate a thick glairy sputum and kill the germs which are buried in it.

A sputum-flask after emptying should be put into cold water with some washing-soda, and brought to the boil. After ten minutes the water should be allowed to cool, and the flask rinsed in plain water. A mug should be cleansed in the same way.

In an institution the contents of a flask or mug are generally sterilised in a steam sterilising apparatus. In a private house one of the following methods may be used :—

(1) Mix it thoroughly with a strong disinfectant, and after allowing it to stand pour the mixture into the w.c.

(2) Empty the sputum into a paper bag containing sawdust, and burn the whole in the fire.

(3) Line the mug with a cone of newspaper or a paper bag; these linings should be burnt at short intervals, and the mug cleaned daily as above.

5. **Patient's Body.**—When discharged from isolation the patient should have a final bath in a different room to that in which he has been living, washing himself thoroughly from head to foot with soap and hot water. After drying himself, he should proceed, wrapped in a clean blanket, to a fresh apartment, where he will find clean clothes waiting for him.

6. **Patient's Room.**—After a patient has finally left his apartment, it, and all it contains, should be disinfected. Everything that can be spared should be burnt, since that absolutely destroys all risk. This should invariably be done in the case of the patient's brush and comb, nail-brush, tooth-brush, and sponge, and the broom which has been used to sweep the floor. Toys and books should also be destroyed, since they are spoilt by effective disinfection. All the clothing, bedding, and any carpets or blinds there may be in the room, should be sent to a disinfecting station to be treated with steam. If that is not possible, they must be disinfected at home with formalin, as described below, and afterwards exposed for some days to the action of sunlight and fresh air, both of which help to destroy the vitality of germs. All small articles—such as knives, spoons, and forks—should be boiled, and all crockery-ware thoroughly cleansed with boiling water.

As a preliminary to the final cleansing, the room and its furniture is usually subjected to *fumigation* or to *spraying* with a disinfectant.

(*a*) In *fumigation with sulphur*, either rolled sulphur or sulphur candles may be used. Every orifice by which air can enter or escape from the room—such as doors, windows, chimneys, and ventilators—is first closed up by the help of paste and paper. The room should then be filled with steam by boiling a kettle over a spirit-lamp, as the sulphur fumes act better on a damp surface. The fire-irons should be removed, otherwise they will be discoloured by the

sulphur. A small room 10 ft. square and 10 ft. high would require about 1½ lb. of sulphur, one twice that size 3 lb., and so on. The sulphur is placed in common earthenware dishes, which stand in larger ones containing water. A little methylated spirit is poured over the sulphur to make certain of its catching fire. The door leading into the chamber is pasted up on the outside, and the room left for twenty-four hours.

(*b*) In the place of sulphur, *formalin* may be used. It is more efficacious as a surface disinfectant, and also more expensive. A special spray apparatus is generally used by the Health Authorities, but if this is not available the *Autan method* may be adopted. For every 1000 cubic ft. of room space to be disinfected, take 5 oz. potassium permanganate crystals and ½ pint formalin, and place in a metal pail. The heat produced by the chemical action evaporates the formaldehyde. The room must be kept sealed for six hours.

At the expiration of the stated time doors and windows are thrown open, and all the furniture in the room—doors, floors, window-sills, &c.—washed. To remove the last traces of formalin vapour, sprinkle a few drops of ammonia about the room. In cases of serious infection—*e.g.*, small-pox or typhus—it is advisable to strip the wall-papers and limewash the ceiling.

VII. The General Care of Fever Patients.

A large, airy, well-ventilated room is necessary, and the fever patient should be given as much fresh air as possible. He must, of course, be confined to bed as long as the temperature is raised. The skin may be frequently sponged, and the mouth should be regularly cleansed. The importance of giving a sufficient quantity of cold water to drink must be emphasised. The diuresis it produces leads to an elimination of toxins, so lessening the tendency to headache and delirium. The bowels should be carefully

attended to, and constipation prevented. The back should be rubbed daily with methylated spirit. Insomnia (p. 323) should be treated from the first, and often a cold sponging or a hot drink will prevent the need for drugs. The drugs usually ordered are chloral and bromide, paraldehyde, and chloralamide. Phenacetin or aspirin is given for headache. If the temperature is high, tepid or cold sponging may be employed, and, in hyperpyrexia, cold baths or packs may be necessary.

The **diet** should be restricted to fluids during the stage of fever, unless this is very prolonged. It should be sufficient to combat to some extent the tissue waste, should be nourishing and easily digested, and, as already said, should include a considerable quantity of water. Milk alone may be given, or this may be varied by flavouring with weak tea or coffee, or by diluting with soda-water, or it may be served in the form of curds and whey. It may be diluted with lime-water or peptonised, if diarrhœa is present; cream may be added and broth given, if there is constipation. Hot drinks or gruel encourage sweating in catarrhs and mild fevers. If less than 3 pints of milk can be got down in a day, nutrition is likely to suffer, and it is well to "fortify" the milk. Plasmon or Somatose may be added, or, better still, a carbohydrate such as lactose (one or two teaspoonfuls dissolved in a little hot water in each glass of milk), Benger's Food, or Horlick's Malted Milk. Jellies may also be allowed in moderation.

Sudden or gradual heart failure, dyspnœa, renal insufficiency, and nervous disturbances, such as delirium, coma, and occasionally post-febrile insanity, are **complications** which may occur in the course of a fever. These are dealt with in their appropriate sections.

NOTE.—*Exanthemata* are acute infectious diseases accompanied by an eruption or rash—*e.g.*, measles, chickenpox.

A *contagious disease* is one which is transmitted only by direct contact with a patient or his infectious discharges — *e.g.*, gonorrhœa, syphilis, leprosy.

An *infectious disease* is one which is transmitted by air, fomites, and carriers, as well as by direct contact with the patient and his discharges—*e.g.*, scarlet fever, smallpox.

CHAPTER XXIII.

SCARLET FEVER AND DIPHTHERIA.

I. Scarlet Fever (*Scarlatina*).

Incubation period, one to three days. In rare cases it is said to be as long as a week.

Symptoms.—In children the illness, if moderately severe, begins with headache, vomiting, and sore throat, followed in twelve to twenty-four hours by the characteristic scarlet rash, consisting of closely-set minute points of a brilliant red colour on a uniformly flushed skin. This appears on the chest, neck, and inside of the thighs, and quickly spreads all over the body. The cheeks are flushed, contrasting strongly with the pallor round the mouth. The tongue is coated, the tonsils and soft palate swollen and brightly injected. The temperature rises rapidly, reaching its maximum about the second or third day. It then begins to descend, falling a degree or two each day, reaching normal about the fifth day. In recent years the type has been milder, and in many cases there is but little constitutional disturbance. Desquamation begins about the seventh day on the face, then on the chest, arms, and inside of the thighs; the hands peel in the third and fourth weeks, and the feet about a week later.

Septic Scarlet Fever.—This is a much more serious form of the disease. In a typical case the soft palate and tonsils are ulcerated, the glands on each side of the neck are enlarged, there is profuse discharge from the nose, de-

lirium, and marked restlessness, with a blotchy eruption which is most marked on the elbows, knees, and buttocks. The temperature remains high for two or three weeks, and then, if the patient recovers, gradually falls to normal.

Toxic Scarlet Fever is rare, and, when well marked, extremely fatal. The throat affection may be slight, the rash is dusky, the temperature, as a rule, high, while delirium, diarrhœa, vomiting, and restlessness, especially the two latter, are prominent symptoms, death generally taking place within twenty-four or forty-eight hours of the commencement of the illness.

Complications.—Of these the most important are—

Joint Affections.—Towards the end of the first week patients often complain of stiffness in the wrists or slight pain in other joints, especially the shoulders and knees. Later on, in the more severe forms of scarlet fever, septic inflammation of one or more joints may occur, ending in suppuration ; this is a highly dangerous complication, frequently resulting in death.

Heart Complications.—Occasionally endocarditis occurs, and still less frequently pericarditis, either of which may lead to chronic heart disease.

Adenitis.—During the third and fourth weeks enlargement and tenderness of the cervical glands are not uncommon ; this adenitis is often independent of any lesion in the throat, and may go into suppuration.

Albuminuria and Nephritis.—Early albuminuria is frequent, and generally disappears on or before the fall of temperature. The poison of scarlet fever is in great part removed from the system by the kidneys. Sometimes the irritation is so intense as to cause actual inflammation or nephritis. The depressing effect of damp cold weather assists in the production of this complication, which is most common towards the end of the third week of the illness.

Otorrhœa.—The middle chamber of the ear communicates with the back of the throat by means of a narrow passage called the " Eustachian tube." The inflammation of the

throat in scarlet fever sometimes spreads up this passage into the interior of the ear, whereupon an abscess forms, which bursts outwards through the "drum," and the patient now has otorrhœa. The otorrhœa sometimes ceases in a week or two, or it may last for months. Young children particularly are apt to develop a *mastoid abscess*, the signs of which are redness and swelling behind the ear.

Post-scarlatinal Diphtheria.—This occurs commonly in the convalescent stage, when children are brought into more intimate contact. It is, as a rule, mild in character.

Tests.—*Dick's test for susceptibility to scarlet fever* is done in the same way as Schick's test (see p. 407), using, instead of diphtheria toxin, the toxin of the scarlatinal type of *streptococcus hæmolyticus*. Small doses of this toxin are also used for immunisation.

The *Schultz-Charlton test for scarlet fever* is sometimes used in cases of doubtful diagnosis. At the height of the eruption 0·2 c.c. of a dilution (1 in 10) of scarlet fever antitoxin is injected into the skin; if the disease is scarlet fever, an anæmic zone appears in 4 to 10 hours.

Nursing and Treatment.—To diminish the risk of nephritis occurring, some physcians keep their patients in bed for twenty-two days, with a view to guarding against chills, for nephritis, if it is going to occur, appears, as a rule, before the end of that time. Others put their patients on a meat diet as soon as the temperature ceases to rise above normal, and a day or two later allow them to get up. A regular action of the bowels is important.

Septic cases require constant attention. What with cleansing the nose, mouth, and throat, and possibly the ears, changing poultices or fomentations and administering food, the nurse seems always to have something to do. Food, which is fluid and as nourishing as possible, is often administered with difficulty in consequence of the pain caused by swallowing. Thus the nasal tube may have to be used, or, if the nose is blocked, glucose enemata given.

Owing to the foul ulcerated condition of the tonsils and

soft palate, the throat in many of these cases requires frequent and careful cleansing by means of lotion and a ball syringe, followed by wet cotton-wool swabs wrapped round the finger. Nurses must never forget that the discharges from the nose and mouth are most infectious, and that whatever is used to wipe them away must always be burnt. When cleaning the mouth, the condition of the teeth and gums should always be carefully observed, the former as regards looseness and the latter as regards ulceration. The hands and instruments should be thoroughly disinfected after each case, otherwise stomatitis will be spread from patient to patient.

It is important that nurses should recognise that *ear-discharge* is by no means the comparatively harmless affection which the general public hold it to be. As long as it lasts there is a possibility of the inflammation spreading inwards through the bone until it reaches the brain, where it may set up meningitis or cause an abscess. Otorrhœa may be preceded by severe earache, which should at once be notified to the doctor, for it is sometimes possible, by the operation of *paracentesis* (*i.e.*, perforating the drum-head with the point of a fine knife), to let out the inflammatory fluid which is present in the middle ear under pressure, and thus relieve the pain and prevent serious damage to the hearing. Otorrhœa may be treated by cleaning the canal with wool soaked in boric lotion, and, after drying with pledgets of wool, instilling two drops of hydrogen peroxide, repeating the treatment every four hours.

In septic cases a careful watch should be kept on all the *joints*, and any sign of tenderness or swelling at once reported.

Nephritis and *post-scarlatinal diphtheria* are treated in the same way as they are when occurring independently of scarlet fever.

For *toxic form* of this disease there is, unfortunately, no special treatment which holds out any prospect of cure.

Period of Isolation.—Private patients are, as a rule, detained for at least six weeks, until desquamation has

finished and all discharges ceased; but from fever hospitals it is customary to send patients home after four or five weeks even though desquamation is not complete, since it is now thoroughly established that peeling in its later stages is not a source of infection. Persistent nasal discharge, otorrhœa, and sores about the nose and mouth, on the other hand, are fertile sources of infection.

II. Diphtheria.

This is due to a rod-shaped germ, *Klebs-Lœffler bacillus*, which settles on one of the mucous membranes and causes it to become inflamed. The exuding lymph coagulates and forms a membrane containing many bacilli, the toxins of which are absorbed into the blood-stream. The *period of incubation* is usually one to three days, though it may be as long as a week.

Susceptibility and Prevention.—Many persons possess a natural immunity to diphtheria. *Schick's test* may be used to distinguish the susceptible from the non-susceptible. It consists in injecting into (not under) the skin a diluted diphtheria toxin, which, if there is no immunity, produces a more or less severe skin reaction. To make sure that any reaction which is produced is really due to active toxin, and not merely to the protein in it, a control injection of diphtheria toxin destroyed by heat is injected into the other arm. Immunity is not necessarily permanent, for some persons reported to be immune according to the test have subsequently developed diphtheria.

If a person is found to be susceptible, he may in many cases be made immune by injecting subcutaneously a standardised mixture of toxin and antitoxin, two more injections being given at intervals of a week. The immunity so conferred develops in from two to twelve weeks after the last injection, and is believed to last three years, perhaps longer.

Faucal Diphtheria.—The illness begins with tiredness, shivering, sore throat, and in children sometimes

with vomiting. White patches appear on one or both tonsils, and may remain limited to those parts, or gradually spread on to the soft palate and back of the pharynx. There is usually some swelling of the neck, and in the more severe cases thin nasal discharge (*nasal diphtheria*). The temperature in diphtheria is usually raised for the first forty-eight hours or so, and then declines to the normal even though the disease is extending. The exudation remains visible on the back of the throat a varying number of days, the tough skin-like form taking longest to separate. The time has been much shortened since the introduction of antitoxin. In the more severe cases a white ulcerated surface is left after the membrane has disappeared.

Laryngeal Diphtheria.—This variety calls for a separate description on account of its dangerous character. It may start in the larynx, or may spread to that part from the fauces.

Symptoms.—When the walls of the larynx become swollen from inflammation, there is obstruction to the entrance of air into the lungs, and the patient has dyspnœa, or difficulty in breathing. Other symptoms are a croupy cough, stridulous respiration, hoarseness and weakness of voice, sucking in of certain parts of the chest-wall during inspiration, and, if the laryngeal obstruction is well-marked, an extreme degree of restlessness. In these cases there is not only the risk of suffocation unless the child is relieved by tracheotomy, but the danger of the disease spreading downwards to the lungs and setting up pneumonia.

Nasal Diphtheria.—Diphtheria affecting both fauces and nose, producing profuse purulent rhinorrhœa with excoriation about the nostrils, is the most serious form of he disease, and often proves fatal.

On the other hand, *Fibrinous Rhinitis*, also produced by the diphtheria bacillus, causes little or no constitutional disturbance, although there may be a considerable amount of exudate present on the nasal mucous membrane. It gives rise to nasal obstruction, with a blood-stained or muco-purulent discharge and sometimes excoriation of the

nostrils and upper lip. It is very persistent, and is recognised as a not uncommon cause of spread of diphtheria.

Diphtheria in other Regions.—Membrane formation with purulent discharge, associated with the presence of diphtheria bacilli, is sometimes seen affecting the *vulva*, the *conjunctiva*, and *wounds*.

Hæmorrhagic Diphtheria.—This variety is practically always fatal. The skin may be covered with numerous fine hæmorrhages like flea-bites, though often there is nothing to be seen beyond a few faint bruise-like marks, sometimes clearly due to pressure by the fingers or bed-pan. Others bleed freely from the various mucous surfaces, and these are very distressing cases to nurse. The hæmorrhage is due to the toxin or poison of the disease producing certain changes in the circulatory system, so that the blood escapes more easily than it ought to do from the vessels. The fact that it is able to produce these changes shows that the poison is an extremely powerful one, and hence accounts for the very fatal character of this variety of diphtheria.

Complications.—Of these the most important is *paralysis*, due to changes in the nerves produced by the toxin of the disease. Paralysis may be limited to the soft palate, in which case the speech is nasal and fluids regurgitate into the nose when an attempt is made to swallow them. This is the mildest and most common form of paralysis. Other muscles which may be affected are those concerned in swallowing, in vision (so that the patient may squint or be unable to read), in limb movements, or in respiration. Lastly, and most seriously, the muscle of the heart may be affected. These different forms of paralysis may occur together or separately.

Other complications are *otorrhœa* and *suppression of urine*, which may accompany cardiac paralysis. Also *albuminuria*, which is common in the acute stage.

Death may occur in the first few days from the intense virulence of the poison. It may be due to pneumonia

from the disease spreading down the windpipe into the lungs; or from exhaustion in cases where there is widespread paralysis; or from failure of the heart muscle when that organ is seriously affected by the toxin of the disease. On this last-named cause of death it is necessary to say a few words.

Paralysis of the Heart, as a rule, comes on towards the end of the second week of the illness, though it may occur much later. The first symptom to be noticed is usually a persistent and apparently causeless vomiting. Accompanying, and sometimes preceding, it there is a marked quickening or abnormal slowing of the pulse. More or less severe abdominal pain is not infrequently present. The child quickly becomes cold and collapsed, usually dying at the end of forty-eight hours. Sometimes death from paralysis of the heart is absolutely sudden and unexpected, there being no warning symptoms whatever.

Chances of Recovery.—These diminish as the exudation extends. The great majority of those children die who come in with swollen necks, thin nasal discharge, fœtor, and extensive deposit of membrane on the tonsils and soft palate. Cases with laryngeal symptoms are dangerous because of the risk of the disease spreading downwards and starting pneumonia. Hæmorrhagic cases always die. Patients suffering from well-marked symptoms of cardiac paralysis hardly ever recover. It occurs, as a rule, among those with much membrane and nasal discharge, though it occasionally appears in the very mild cases. Finally, the older the patient, the better the chance of recovery.

Nursing.—The great danger and cause of death in this disease is *failure of the heart*. The poison of diphtheria has the power of producing certain changes in the muscular fibres of that organ which most seriously weaken it, leading in many cases to the sudden death of the patient. The nurse's one idea should be to keep such a case at *absolute rest*. On no account should the patient attempt to sit up in bed until the medical attendant has given him permis-

sion to do so. This, in a bad case, will probably not be for some weeks from the commencement of the illness.

The most important point, then, in the nursing of severe diphtheria is rest, and this should govern every detail of the patient's daily life. He must not be allowed to feed himself, nor to raise his head off the pillow when he is about to drink. He must not sit up in bed to have his throat syringed, and he must be lifted by his attendants when the bed-pan is placed under him. He should not even turn himself in bed without assistance. It does not matter how well he feels or looks; his heart may be so weak that the slightest strain on it will cause it to stop. Again and again patients have died suddenly who, to the unskilled observer, have had little or nothing the matter with them up to the very moment of death.

The *food* in the acute stage will, of course, be fluid and digestible. In very mild cases solids are allowed from the commencement. If the attack is a severe one, it is a good plan to allow the patient to suck the food out of the feeder by means of a bent piece of glass tubing, or to syringe it into his mouth. If he drinks it, the nurse must raise his head a few inches from the pillow with her left hand. For young children it is sometimes necessary to use the nasal tube. With convalescence comes a gradual return to ordinary diet.

The throat and mouth will need cleansing by syringing and swabbing, the patient's head being brought to the edge of the pillow, so that it hangs over the basin into which the lotion will run. For wiping away discharges from the nose and mouth, pieces of soft rag or wet cotton-wool should be used, and afterwards placed in a kidney-tray to be burnt.

Patients suffering from hæmorrhagic diphtheria need very gentle handling, because of the ease with which bruises are produced.

A nurse should always be on the look-out for any sign of paralysis, such as weakness of the limbs, squinting, a nasal voice, difficulty in swallowing, or coughing when drinking.

This last symptom should be at once reported, for it shows that the larynx is not being properly closed when the child attempts to swallow. Hence, fluids are able to get into the air-passages. If they are not expelled by coughing, they may set up broncho-pneumonia. In such cases the milk may be thickened with arrowroot or corn-flour ; or, if this is unsuccessful, be given by means of a nasal tube.

Antitoxin.—The treatment of diphtheria by means of antitoxin is described in the chapter on Immunity (p. 244). (See also p. 151.)

Treatment of Cardiac Failure.—For this, the most dreaded and fatal complication of diphtheria, but little can be done. As a rule, feeding by the rectum is necessary, on account of the persistent vomiting ; the child is kept lying on its back, the pillow and bolster being removed, and if necessary the foot of the bed is raised. In almost all cases, however, death results.

Treatment of Laryngeal Diphtheria.—When a croupy cough and noisy respiration show that the diphtherial inflammation has invaded the larynx, the child is placed in a steam-tent. Great care must be exercised to prevent the child scalding itself. To obviate the risk of fire, the kettle should be stood in a small foot-bath. If, in spite of this treatment, the dyspnœa and restlessness increase, the operation of tracheotomy is performed.

Tracheotomy.—This relieves the difficulty of breathing by means of an opening which is made in the upper part of the windpipe immediately below the larynx (p. 605). Into this opening a curved silver tube is inserted, through which the patient can breathe. A second tube fits closely into the first, and can be taken out to be cleaned as often as is necessary. Directly a child shows signs of laryngeal obstruction, the nurse in charge should get everything ready for tracheotomy.

The great secret of success in the *after-treatment* of tracheotomy is to interfere with the patient as little as possible.

Many medical men discontinue the use of steam after

operation, the opening of the tube being covered with a sponge wrung out of hot water, so that the child may inhale warm moist air, or with a folded square of sterile gauze, which is intended to play the part of a filter and keep dust from getting into the windpipe.

A nurse should always keep her mouth shut when making any application to a patient's throat, or when attending to the tube in a case of tracheotomy. If she notices that the patient is about to cough, she should hold a sponge in front of the tube, or turn her head away. Any membrane that



Allen's Bronchitis or Tracheotomy Kettle.

is coughed up should be burnt. If it is to be preserved, it should be placed in a test-tube and the tube plugged with cotton-wool.

The use of sterilised feathers is absolutely forbidden by some doctors, while others hold that they are occasionally of service and should therefore be permitted. A feather should only be used when it is evident that there is some obstruction from membrane or mucus in the trachea below the tube, as shown by the child continuing to breathe badly after the inner tube has been removed. It must never be used as a substitute for the removal of the inner tube.

The inner tube should be removed and cleaned whenever the breathing becomes in any way noisy or laboured. While doing so, the nurse steadies the outer tube with the thumb and forefinger of the left hand, otherwise its lower end may be dragged out of the trachea. Sometimes, when being replaced, the inner tube does not slip easily into the outer, but sticks half-way. When this happens the nurse should place the first finger of each hand beneath opposite ends of the metal shield, while with her two thumbs she steadily forces the inner tube home.

Severe Dyspnœa after Tracheotomy may be due to one of the following causes :—

(*a*) *Blocking of the inner tube with Membrane.*—If this is so, the removal and cleaning of that tube will at once give relief.

(*b*) *Slipping of both tubes out of the Trachea.*—It is highly important that nurses should be able to recognise this condition and know how to treat it, since it is the most common cause of sudden and severe dyspnœa after tracheotomy. It is sometimes due to the tubes having been tied in too loosely ; or to the child pulling on them (paper splints should be put round the child's elbows for the first twenty-four hours after operation) ; or it may result from the tracheal opening being low and the tube short. This form of dyspnœa comes on absolutely suddenly, and is often of a very urgent character. The sudden onset, together with the bulging forward of the tubes, and the fact that no air is passing through them, and that the child has to some extent regained his voice, will tell an observant nurse what has happened, and she will report the matter to the doctor at once. If, however, it is obvious that the child is not getting sufficient air into his lungs and interference is urgent, she is justified in cutting the tapes and removing the tubes, for leaving them can only do harm and it is impossible to push them back into place.

To remove both tubes, the nurse should place the child with its head hanging over the side or foot of the bed, and sit on its right hand. If she is alone, it is as well to pin a

sheet closely round the child, so that it cannot move its arms. She then cuts the tape on each side, and removes both tubes. If the patient now breathes comfortably, it should be placed in its bed again. If the dyspnœa continues, the dilators should be carefully introduced, the nurse's left hand being placed on the child's forehead to steady its head. If it is now relieved, a blanket should be thrown over it, and the nurse must try and keep it quiet till help comes.

Should the tubes have slipped out of the trachea while the nurse is absent from the room, and she finds the child apparently dead on her return, she must at once remove the tubes and do artificial respiration. If air does not seem to be entering the wound, the dilators must be introduced. If the nurse is alone, she must hold them in with one hand and squeeze the child's chest with the other. Under these circumstances she ought always to try artificial respiration, even though the child appears to be quite dead.

(*c*) *Blocking of the Trachea below the Tracheotomy Tubes.*—If the inner tube is clear, and the outer is in position, the dyspnœa must be due to blocking of the trachea with a large piece of membrane, which is perhaps only partially detached and therefore cannot be coughed up. This cause of dyspnœa is not so sudden in onset as that previously described. If the medical attendant approves of the employment of feathers, now is the time to use one, as it may complete the detachment of the obstructing piece of membrane, and so assist in its removal. If the child seems to be moribund, and the doctor has given the nurse instructions to do so, she must, as a last resource, take out both tubes and introduce the dilator. She should always send at once for assistance if any serious difficulty of breathing comes on which is not relieved by cleaning the inner tube.

To recapitulate the steps which a nurse should take in dealing with one of these cases—

1. Remove the inner tube. If the obstruction is in this tube, relief follows.

2. Examine next the position of the outer tube. A wisp of dry wool held in front of it will show if any air is passing through the tube. No movement of the wool indicates displacement of the tube, and action as above described may be called for, if the dyspnœa is severe.

3. The outer tube being in position, the dyspnœa must be due to blocking of the trachea with membrane, to assist in the removal of which a feather may be used.

In some cases a considerable degree of dyspnœa persists after the operation of tracheotomy. This is an indication that the lower part of the trachea, and possibly also the larger bronchial tubes, are lined with diphtheritic membrane. It is an extremely dangerous condition. Feathering the trachea will occasionally do good, while if respiration is dry and whistling, spraying the wound with saline solution, or dropping a mixture of creosote and olive-oil into the trachea, sometimes brings relief by softening the membrane and rendering its separation easier.



Opening in trachea made by the operation of tracheotomy.

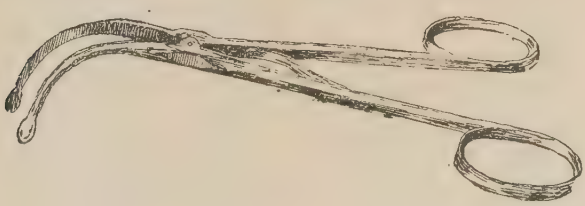
The following should be kept close to the child's bed, ready for immediate use if required: the dilator, a pair of scissors, a clean inner and outer tube of the same size as the patient is wearing (the latter with tapes attached), and clean gauze or lint shields for placing between the skin and tracheotomy tubes. All instruments should be placed after use in a porringer, and not laid down on the nearest locker or table.

The Use of the Tracheotomy Dilator.—The dilator figured here is usually held in the same way as a pair of scissors; it should be noticed, however, that the blades become separated as the handles are pressed towards each other, as shown in the illustration. A difficulty, at any rate for a beginner, is that if pressure is put upon the handles prematurely the blades open, and are then unable to pass together through the small wound in the windpipe,

since when one is engaged in the opening the other is outside it. This instrument ought never to be used unnecessarily. It is only during the first twenty-four hours after operation that there is likely to be any difficulty in passing it.

The *feeding* of these cases is usually straightforward enough, though occasionally there is some difficulty, particularly when the tracheotomy tube is finally removed. Fluids then sometimes get into the larynx, and are coughed out of the wound. Thickening the milk with arrowroot or corn-flour may relieve the condition, but not infrequently nourishment has to be administered by means of the nasal tube.

Intubation.—This is an operation which many surgeons

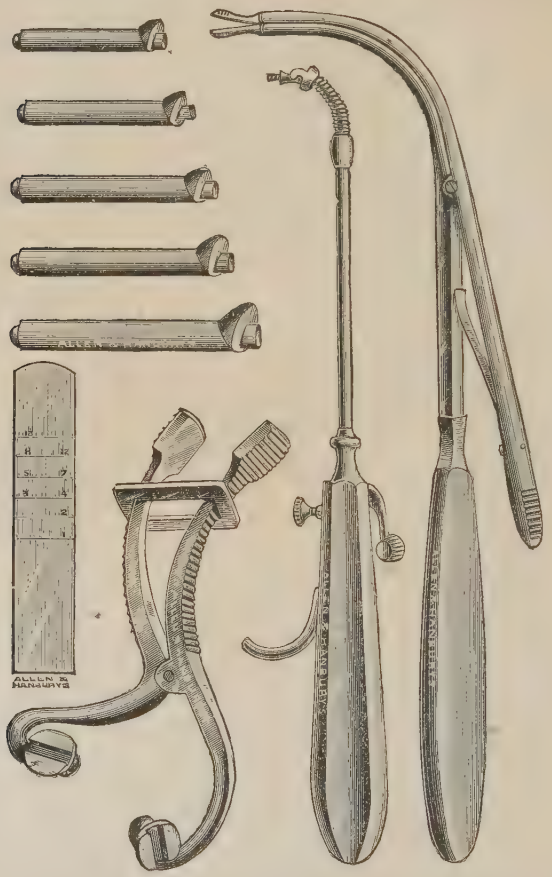


Tracheotomy Dilator, opened.

prefer to tracheotomy. It has the advantage of being bloodless, and can be performed by an expert in a few seconds. By means of a special carrier an intubation tube is passed into the larynx; through this the child is able to breathe. The upper end of the tube is expanded, so that it cannot slip down into the trachea. Through a small hole in the upper end of the tube is passed a piece of strong thread or fine string. This is brought out of the mouth and fastened down on to the cheek with strapping. By means of this piece of string the tube can be at once removed. Some operators dispense altogether with the use of string or thread, and when they wish to remove the tube simply squeeze it out of the larynx.

After the operation, paper splints should be put on the

child's arms, to keep it from pulling on the string and so dislodging the tube. The patient should be kept lying on



Intubation Tubes with Introducer, Extractor, Mouth Gag, and Measuring Scale.

one side, so that the saliva and mucus may not run out of the mouth on to the cheek to which the thread is fastened; otherwise, they will soften and loosen the strapping.

Should the patient's breathing become suddenly and seriously embarrassed, as may happen if the tube is blocked with a large piece of membrane, the nurse must remove the strapping, and draw the tube out by means of the string, at the same time sending for assistance.

The feeding of these cases is a matter of some difficulty, fluids tending to pass down the intubation tube into the trachea. Occasionally the patient is able to swallow thickened foods, but the majority have to be fed by means of the nasal tube.

Return Cases.

The term "return cases" has been applied to cases of scarlet fever or diphtheria which arise in the patient's home after he has been discharged from hospital. The frequency of return cases of scarlet fever ranges from 3 to 6 per cent; after diphtheria they are less frequent. The complication which is most frequent after discharge in infecting cases is an unhealthy condition of the nose, less frequently otorrhœa, or a combination of rhinitis and otorrhœa. Late desquamation cannot be regarded as evidence of infection. The nurse can help to diminish the number of return cases by careful attention to the nose and ears and any sore places; it is important also to prevent the child developing a catarrh as a result of the final bath and journey home.

CHAPTER XXIV.

ENTERIC FEVERS.

Typhoid Fever is due to a germ, *bacillus typhosus*, which is found in the urine and fæces of patients who suffer from this disease. The micro-organism is usually introduced into the body by means of food or drink. It sets up inflammation of the Peyer's patches and " solitary " glands, especially those that are situated in the last two or three feet of the small intestine.

During the *first week* of the illness these glands swell.

During the *second week* the swelling subsides if the case is a mild one ; otherwise, inflammation goes on and sloughing commences.

In the *third week* the sloughs separate, leaving the typhoid ulcers in the wall of the bowel.

In the *fourth week* the ulcers begin to heal.

These stages are not always present. In children the inflammatory process seldom goes on to sloughing.

This fever occurs mostly in young adults, and is especially prevalent in the autumn. It is often due to contamination of water, milk, oysters, cockles, and water-cress.

Paratyphoid Fever, though due to infection by organisms distinct from the typhoid bacillus and known as *B. paratyphosus A* and *B*, may be indistinguishable clinically from typhoid fever. It is usually milder and less protracted.

Symptoms.—These usually begin about two weeks

from the date of infection, this being consequently the length of the period of incubation.

In the *first week* the patient goes on trying to do his work, complaining of severe headache, loss of appetite, and general malaise. After a few days he is obliged to give in and take to his bed.

During the *second week* his tongue becomes dry, and red in the centre, with a band of fur on each side, his expression weary and languid, and a rash of small pink ("rose") spots appears on the abdomen and sometimes on the chest and back. It appears in crops. A certain amount of bronchitis is usually present, and the nurse should be on the watch for retention of urine. The bowels may be loose or constipated. The agglutination reaction of Widal (see p. 243) is not positive until the seventh or eighth day, and may be still further delayed.

During the *third week*, if the case is a mild one, the patient begins to mend, or his condition may remain about the same; if, on the other hand, he is suffering from a severe attack, all the symptoms become markedly intensified.

During the *fourth week* convalescence usually commences.

Temperature.—The chart in typhoid fever is often very typical (see chart, p. 100). There is a gradual rise during the *first week*. During the *second and third weeks* the temperature remains up, falling a degree or two each morning, and rising again in the evening. In the *fourth week* it gradually comes down again to normal. Many charts, however, are not of this typical character, some, especially in children, being of much shorter duration.

Complications.—These are somewhat numerous, the following being the most important:—

1. *Relapse.*—This may occur after the temperature has reached normal, or while it is in the falling stage. It is, as a rule, less severe than the original attack.

2. *Hæmorrhage from the Bowel.*—This is a very important complication. The bleeding-point is situated in the floor of one or more of the ulcers left by the separation of the

slough of a Peyer's patch or a solitary follicle. Hæmorrhage is most common in the *third week* of the illness, when the sloughs begin to separate. Gradually increasing pallor and faintness, together with a rising pulse and a falling temperature, point to internal hæmorrhage, even if no blood has yet appeared in the stools.

3. *Perforation of Intestine.*—This is the most dreaded and most fatal complication of typhoid fever. In the floor of an ulcer which has been left after the separation of a slough from a Peyer's patch or a solitary follicle, a minute aperture appears, through which the contents of the bowel escape into the abdominal cavity, and set up what is usually a fatal peritonitis. Its onset may be marked by sudden abdominal pain, more rapid pulse, a rigor, and collapse; or, if the patient is very ill, there may be no obvious symptoms. This complication usually occurs during the *third or fourth week. Any pain in the abdomen should be at once reported by the nurse;* very sudden pain, of great severity but gradually passing off, is very suggestive of perforation, in which event immediate operation affords the only hope of recovery.

4. *Peritonitis.*—This generally results from perforation of the bowel. The symptoms are intense abdominal pain and tenderness, frequent vomiting, a rapid pulse, and a sunken and anxious face.

Personal Care of the Patient.—The room must be well ventilated but free from draughts, quiet, and kept as nearly as possible at a temperature of 60°. It is very important that the bed, which must not face the window, should be narrow, so that the patient can be easily moved by the nurse. In private houses two beds are sometimes used, one for day and the other for night. A little spirits of lavender, or eau-de-Cologne, may with advantage be added to the tepid water with which the patient is sponged in the morning and at night. Owing to the wasting induced by this disease, particular care must be taken in the prevention of bed-sores.

Towards the end of the illness patients, prostrate from

extreme weakness, sometimes perspire profusely at night. Should this occur, the patient must not be left in his damp night-dress, but be sponged with tepid water, dried with a warm towel, and put into a fresh gown.

Special points to be noted in the nursing of these cases are—

(*a*) *Extreme gentleness and care in moving the Patient.*—Any roughness in handling him might result in the giving way of the thin and softened bowel-wall, or lead to the disturbance of a clot which is plugging the open mouth of an artery in the floor of an ulcer, and so set up hæmorrhage. For the same reason, the patient should always be kept in the recumbent position until the doctor says he may be propped up, and he should never be left alone. Especial care is necessary in placing him on the bed-pan.

(*b*) *Frequent and thorough cleansing of the Mouth.*—In severe cases of typhoid fever the tongue becomes dry and brown, and the teeth are covered with sordes. In such cases the mouth should be cleansed every three or four hours by means of strips of wet lint or wool wrapped round a pair of dressing forceps, or the forefinger, and dipped in some antiseptic mouth-wash. The tongue, roof of the mouth, both sides of the teeth and gums, should be carefully and systematically gone over, assisted by the regular use of a tooth-brush.

(*c*) *Changing the position of the Patient.*—Bad cases of enteric lie helplessly on their backs, not moving of their own accord until improvement sets in. The patient should from time to time be turned first on to one side and then on to the other, being kept in position by means of pillows. This will also lessen the chance of hypostatic congestion of the lungs and bed-sores.

The special precautions to be taken against infection, when nursing a case of this disease in private, have already been described. The possibility of the urine being extremely infectious must always be borne in mind. The draw-sheet should be changed directly it is soiled; and if the patient is in a general ward, all vessels in use by him should be

marked and kept separate. To safeguard herself, the nurse should keep her nails as short as possible, and never omit to scrub them at once after attending to the patient as well as before taking food. Cuffs should not be worn, and the dress should be protected from infectious matter by linen sleeves, or the nurse should work with bare arms.

Feeding the Patient.—This is a most important matter, for an attack of typhoid fever means frequently a long and wasting illness. At the same time, great care is needed, since the powers of digestion are frequently impaired. The diet in the acute stage of the illness is usually limited to liquids. Of these, milk is the one upon which we chiefly depend. The addition of plasmon materially increases the amount of nourishment which it contains. Sugar of milk is also a most valuable food; it is easily digested and tends to diminish wasting. Beef-tea, as well as thin soups and broths, are also given, and occasionally raw eggs, light custards, and jellies. Beef-tea is useful as serving to break the monotony of a milk diet. It should be taken hot and have plenty of salt added to it Meat juices and essences, if given alone, should be iced. Ice-cream, flavoured with coffee or chocolate, is sometimes given, and usually much enjoyed by the patient.

A more abundant diet than this has been tried by some physicians in the acute stage of enteric fever, solid foods, such as fish and chicken, having been given, it is said, with good results. If the patient's tongue is clean and moist, and he expresses a desire for solid food, it is believed that such articles as bread and butter, toast and butter, eggs, apple sauce, and mashed potatoes can safely be given.

In the giving of milk certain difficulties may arise.

1. *Indigestion.*—Masses of curd may form in the stomach which the patient is unable to digest. Diluting the milk with plain water or barley-water will often overcome this difficulty. If it does not do so, the addition of citrate of soda, one to two grains to each ounce of milk, is often effectual, or the milk may be peptonised for a short time.

2. *It may cause loathing.*—Flavouring it with a little strong tea or coffee will usually for a time get over this objection. Constant and careful cleansing of the mouth with some freshening wash, such as lemon-juice in glycerine and water, and the giving of a drink of water before and also after the milk, will diminish the patient's objection to food; but the surest plan is to vary the diet as much as possible, giving milk (at one time flavoured with tea, at another with coffee), cream and whey, junket, home-made koumiss, ice-cream, beef-tea, veal and chicken broth, &c.

3. *It may not satisfy.*—As the acute stage begins to subside patients become very hungry, and milk then seems a very poor substitute for solid food. Now is the time for a nurse, with the doctor's consent, to exercise her ingenuity in presenting the milk in different forms. She should in this way be able to tide over the few days that must elapse before solid food is allowed. During this stage, or even earlier, bread-jelly and cream, with the medical attendant's sanction, is quite permissible.

The *quantity of milk* ordered for an adult is usually about three pints in the twenty-four hours. If a patient asks for it, and is taking his milk well, it is usual to allow him plenty of plain cold water to drink; indeed, it is most desirable that he should be given as much as three or four pints in addition to the milk in the twenty-four hours. It refreshes him, and, by flushing the tissues, helps to cleanse the system of the excess of waste products produced by the fever, while it hastens the removal of toxins. Home-made lemonade, iced, with a little claret or sherry in it, forms a most refreshing drink.

If it does not cause indigestion, a good cup of tea twice in the twenty-four hours is usually much appreciated by typhoid fever patients. 4 A.M. and 4 P.M. are about the best times to give it.

It is highly important that the patient's food should be administered to him in regular quantities, and at regular hours. When doubtful as to the advisability of waking him every two hours during the night, the nurse must

take into consideration the degree of weakness from which the patient is suffering, together with the amount of sleep he has lately had. When doing so, she must guard against mistaking for healthy sleep the heavy drowsiness which is associated with extreme prostration. An interval of three to four hours would be quite long enough for an average case, and two hours for one in which there was any marked degree of prostration. A skilful nurse will often be able to give her patient a drink of milk without completely rousing him from his slumbers.

As the *convalescent stage* approaches, and the patient's appetite begins to assert itself, a gradual return will be made to ordinary food. Physicians vary a good deal as to the rate at which they allow this return to be made. Some, as already said, give their patients solid food as soon as they ask for it; others allow nothing but milk for at least ten days after the temperature has reached normal.

Medical Treatment.—Vaccine treatment has proved efficacious in some cases, the best results being obtained when the treatment is begun before the tenth day. Otherwise actual treatment of the disease itself is limited to the administration by the mouth of various antiseptics (which are given with a view to hindering the growth of germs in the bowel and so to promote the healing of the ulcers), and to the systematic use of baths or sponging. When baths form part of the regular treatment of enteric, they are given as often as the temperature, taken four-hourly, is found to be at or above 102.2°. Too frequent actions of the bowel are checked by the administration of opium, while enemata are used if constipation is present. They must be given very slowly and carefully, as too energetic peristalsis might set up hæmorrhage.

Alcohol is given in enteric under the following conditions:—

In the acute stage, when the patient is taking his food badly. In such a case weak brandy-and-water, or a light wine such as hock, is given before food, to freshen the palate and stimulate digestion. Later, it is given to stimulate the heart, if that organ shows signs of failing. For this

purpose it is better not to dilute the spirit with more than two parts of water, otherwise its stimulating effect is rendered too feeble. For the same reason, it should not be given just before or after a drink of milk, or it will be diluted by the latter when it reaches the stomach. Finally, it is taken as port wine during convalescence.

Sleeplessness sometimes calls for the use of hypnotics. In slighter form it may be relieved by sponging the face and hands, or even the whole of the body, with tepid water, removing a portion of the bed-clothes, placing a hot bottle to the feet if the latter are cold, or giving a hot drink, especially if there is a feeling of weight or oppression at the pit of the stomach. If it is caused by severe headache in the early stage of the illness an ice-bag should be placed on the head or a cold compress on the forehead.

Treatment of Complications.—

Hæmorrhage.—When an artery in the floor of an ulcer begins to bleed, plugging of its orifice by clot is the only thing that will stop the bleeding. To assist in the formation of this clot, it is most important that the patient should be kept absolutely at rest. He should not be allowed to use the bed-pan, but should pass his motions into pads of wool and carbolised tow. A full dose of opium is usually given to check the movements of the intestine, which might otherwise dislodge the clot that is forming. With the same end in view, an ice-bag, suspended from a cradle, is generally placed on the abdomen just above the right groin; for beneath that point is the lower end of the small intestine, and therefore probably the seat of hæmorrhage. At the same time stimulants are, if possible, discontinued, for a strongly-beating heart would dislodge the clot. Should the patient become faint or collapsed, his head should be lowered, the foot of the bed raised 12 in. from the ground, ammonia given him to inhale, or a hot fomentation applied over the region of the heart, resorting to the use of alcohol if these measures fail. It is advisable to cut down the quantity of fluid taken so as to lower the pressure in the blood-vessels by

diminishing the amount of blood in them, and to substitute whey or albumen-water for milk.

Perforation and Peritonitis.—It is the rule, if the patient's condition will allow of it, to open the abdomen and close the perforation by sutures.

Abdominal Distension.—This, when extreme, is a troublesome symptom, since the distended bowel presses the diaphragm upwards, and so embarrasses the working of the heart and lungs. The large intestine is usually the part affected. Tympanites is caused by fermentation of milk in the intestine, and consequent formation of gas. When this symptom is present, whey or albumen-water should be substituted for milk. A turpentine enema may be given, or the long rectal tube passed and for a time left in position. Cold applications to the abdomen tend to prevent the occurrence of tympanites; oil of cinnamon is sometimes given for the same purpose.

CHAPTER XXV.

VARIOUS INFECTIOUS DISEASES.

I. Smallpox (*Variola*).

Incubation period almost always twelve days.

Symptoms.—The onset is sudden, the patient being seized with vomiting, headache, shivering, and severe pain in the back, accompanied by a rapid rise of temperature. With children diarrhœa is common, and they may also have convulsions. During the first three days, while the temperature is rising, various irregular rashes may appear.

Eruption, as a rule, appears on the third day, usually first on the face, and a little later on the wrists. Thence it spreads to the trunk, and last of all to the lower extremities. The palms and soles are also affected. The face and extremities are always more affected than the trunk. It takes about three days to come out. The spots are at first papules or flat pimples; in a few days these become vesicles, with a little depression in the centre. About the eighth day the vesicles become pustules, which later rupture and form scabs.

Temperature.—When the rash appears, the temperature begins to fall, reaching normal, or nearly normal, in about three days, by which time, except for the eruption, the patient seems to be quite well. Three or four days later the temperature commences to rise again. This is called the *secondary fever*, or *fever of suppuration*, since it coincides with the occurrence of suppuration in the pocks.

The patient feels ill, is restless, and in some cases delirious. In a few days the temperature falls again, and convalescence commences.

Before passing on to the complications of this fever, it will be as well to mention and briefly describe its several varieties.

1. *Modified Smallpox* occurs in persons who are partially protected by a previous attack of the disease, or by vaccination. The symptoms are mild, and the eruption scanty and ill-developed. Such a mild case may, however, give rise to one of the more severe forms of the disease in an individual not similarly protected.

2. *Discrete Smallpox.*—This is the mildest form of unmodified smallpox. Its symptoms and course have been described above. It is called "discrete" because the individual pocks or spots remain separate and do not coalesce.

3. *Confluent Smallpox.*—This is a much more severe variety. The eruption is profuse, and the spots run together, forming large blebs. The temperature is high, and the constitutional disturbance very severe.

4. *Hæmorrhagic Smallpox,* or *Malignant Smallpox.*—This is by far the most serious form, since it is practically always fatal. Bleeding takes place under the skin, from the nose, mouth, eyes, ears, rectum, &c., and the rash itself becomes hæmorrhagic.

Complications.—The most common are bronchitis, broncho-pneumonia, and boils. Serious affections of the eye, which were formerly by no means uncommon, are now, owing to improved methods of treatment, but rarely seen.

Chance of Recovery.—This depends on the age of the patient, presence or absence of previous vaccination, and the character and abundance of the rash. Smallpox is very fatal to young unvaccinated children. It usually assumes the "modified" form in those who have at some time or other been vaccinated. The more recent and more efficient the vaccination, the milder will be the attack. In

unvaccinated patients the character of the eruption is, as a rule, the most reliable guide in forming an opinion of the chances of recovery. Hæmorrhagic cases always die; of those with a "confluent" rash only a half get well; while, if the eruption is "discrete," not more than one in every twenty-five fails to pull through.

Nursing and Treatment.—Warmth and good ventilation are both essential—the former on account of the liability to lung complications, the latter for the very offensive odour which accompanies bad cases of this disease.

The diet should be light and nourishing, especially if there is much suppuration in the later stages of the illness. Tepid sponging is useful when the patient is restless and delirious. Warm baths are usually given night and morning while the rash is present, except in very severe cases. Sometimes, if there is much suppuration, the patient is kept for days at a time in a continuous warm bath. This keeps the skin clean, and tends to check the formation of pus. Drying should be effected by means of warm soft towels.

Sponging the skin with water, in which a little spirits of lavender or eau-de-Cologne has been mixed, helps to relieve the itching, and neutralise any unpleasant odour. Iced compresses are useful, when there is much pain and swelling of the face and hands.

The pocks should be treated with an antiseptic ointment. Severe itching during the healing stage is relieved by sponging with dilute acetic acid and water, or with weak lead lotion. The face should be protected from the patient's fingers by covering it with a mask, and muffling the hands with wool and lint. The hair ought always to be cut quite short. Careful attention should be paid to the mouth.

Delirious patients require constant watching, as they are often very violent. In such cases it is as well to have a sheet passing loosely over the front of the chest and fastened to each side of the bed. The attendant must be physically capable of controlling the invalid.

Serious complications of the eyes can only be prevented by the most scrupulous cleanliness. Frequent bathing with boracic or weak perchloride lotion is essential when the conjunctiva is inflamed.

If the patient is very feeble, and especially if he has any lung complication, he should not be allowed to lie for long at a time on his back, but should be gently turned on to one side or the other. This will diminish the risk of bed-sores, and prevent blood stagnating in the bases of the lungs.

Soft rags or wet wool should be used for wiping away discharges, and should, together with any scabs or scales, be subsequently burned.

Period of Isolation.—The infection of smallpox is so easily disseminated that all cases should be at once removed to a hospital. Isolation must be continued until all scabs have fallen off, and all sore places are healed.

Vaccination.—The theory of vaccination (*i.e.*, inoculation with vaccinia) was described in the chapter on Immunity (p. 246). The law demands that vaccination be performed within six months of the birth of the child, but any one who professes a conscientious objection to it can obtain exemption by making a declaration to that effect.

The technique of vaccination is as follows: the skin of the left upper arm is cleansed with soap and water and then ether. Four places over half an inch apart are then scarified with a blunt lancet or needle, but not to the extent of definitely drawing blood. A drop of lymph is placed on each, and rubbed in with the needle. It is left for at least a quarter of an hour to dry, and is then covered with lint or gauze and strapping to protect from sepsis.

Vaccinia.—On the third day a papule appears with a red zone; on the sixth day it has become a vesicle, which by the eighth day has a marked central depression (umbilication); by the tenth day it is pustular, with the surrounding skin swollen and painful; on the twelfth day the pustule begins to dry; the scab separates about the twenty-first day. In revaccination the course is often shorter and usually

less severe. The protection lasts probably only ten to fifteen years, hence the need for revaccination.

Prior to the discovery of vaccination, protection from smallpox by deliberate *inoculation* of the disease was very generally practised in this country. It usually produced a comparatively mild attack of smallpox, but as it naturally led to spread of the disease it was made illegal in 1840.

II. Chickenpox (*Varicella*).

This is a distinct disease from smallpox, and occurs usually in children under ten years of age. The cause is unknown. It is highly contagious, the infection being usually communicated directly from patient to patient, but being sometimes carried on clothes. The incubation period varies usually between twelve and twenty-one days, cases generally occurring thirteen to eighteen days after exposure. One attack usually protects from another.

Symptoms.—The rash is usually the first sign, and appears on the first day, earliest on the trunk. The trunk and scalp are most affected, the face and limbs less, and the parts near the trunk (*proximal*) are more affected than those farther away (*distal*); spots may occur on the palate. The number of spots may vary from ten to several hundreds. The lesions are generally vesicular from the beginning, but sometimes there may be seen rose-coloured papules, which change in a few hours to vesicles. These soon rupture, shrivel, and form crusts. In some cases deep ulcers are produced by suppuration under the scabs. Crops, usually about three, appear on successive days, and all stages of the eruption may be present simultaneously in the same region.

Diagnosis from Smallpox.—In chickenpox the rash appears on the first day; in smallpox on the third. In chickenpox the patient may have been vaccinated within seven years; in smallpox not so. In chickenpox the rash

is most marked on the trunk and the proximal parts of the limbs; in smallpox on the face and the distal parts of the limbs. In chickenpox, papules, vesicles, and crusts may be seen in the same region at the same time; in smallpox all the lesions in a particular region are generally either papules or vesicles or pustules or scabs. In chickenpox the papule is obviously superficial; in smallpox it feels set in the skin. In chickenpox some at least of the vesicles are oval; in smallpox they are always circular.

Treatment.—Isolation is required until the last crust has separated. The patient should remain in bed for seven to ten days, and the lesions must be kept clean. Scratching should be prevented, and itching allayed by sponging with warm boric lotion or by warm baths containing Condy's fluid. Hot fomentations may be applied in cases of ulceration, and warm baths will hasten the separation of scabs.

III. Typhus Fever.

This is now very uncommon in England, but Ireland has suffered heavily. It is almost always associated with conditions of filth and privation, and it has been proved that *lice*, especially body-lice, are necessary for the spread of the disease. The incubation period is one to two weeks. The onset is sudden, and there is early prostration. The temperature rises to a maximum on the fifth day. A mottled rash with papular spots (*mulberry rash*) appears on the fourth day. Delirium is common, and the fever ends by a crisis on the fourteenth day.

The patient should be removed to an isolation hospital and treated in an open tent or open-air ward. All lice and nits on the bodies, clothing, and bedding of infected persons should be destroyed, and the room fumigated or sprayed with a strong disinfectant.

IV. Measles (*Morbilli*).

This disease is the cause of a large number of deaths every year among young children, the mortality from it being much higher than that from scarlet fever. It is seldom seen in adults.

Incubation period is most commonly ten days, extreme limits eight to fourteen days.

Symptoms.—These, to begin with, resemble an ordinary catarrh. The child is feverish, its eyes water, and it coughs and sneezes. After this condition has lasted three or four days, the rash begins to make its appearance, at first as faint red spots behind the ears, and on the forehead about the roots of the hair. From these parts it quickly spreads over the face, the spots becoming larger and darker, until at the end of twenty-four hours the cheeks and forehead are covered with blotches of a dark-red rash, giving to the patient, with the swollen and watery eyes, a very characteristic appearance. From the face the eruption spreads downwards on to the skin of the trunk and extremities.

Koplik's spots are fine greyish-white dots which appear on the mucous membrane of the cheeks opposite the lower molar teeth two or three days before the rash. When scanty they are not easily detected. They are absolutely diagnostic of measles.

The *temperature*, after being slightly raised during the catarrhal stage, shoots upward when the rash comes out. After remaining up for about forty-eight hours, it, in the absence of complications, quickly falls to normal.

Infectivity is soon lost in this disease, and patients are free from infection at the end of ten days from the appearance of the rash. Prior to the rash, and during the catarrhal stage, the child is highly infectious.

Complications.—*Otorrhœa, diarrhœa,* and *conjunctivitis* are not uncommon, and are treated in the ordinary way. *Ulcerative stomatitis* is rarely seen nowadays.

Affection of the Air-passages.—This is by far the most

common and most dangerous complication of measles, and is responsible for the majority of the deaths due to that disease. Any part of the respiratory tract may be affected. If the larynx is involved the same symptoms are present that were described in the chapter on Diphtheria. Almost every case has a certain amount of bronchitis, and this may become so severe as to cause the death of the child; or the inflammation may spread still further into the lungs, and set up broncho-pneumonia.

Nursing.—While direct draught should be carefully avoided, by the use of screens if necessary, it is most important that the room should be freely ventilated by means of an open window and a fire. Warmth of the atmosphere is more important in measles, especially in the early stage, than in any other fever, except laryngeal diphtheria. The temperature of the room should be kept at about 65° F., but must not rise above 70°. Daylight should be freely admitted, but glare should be avoided by partially lowering the blind, and placing the bed so as not to face the window. The bed-clothes should be light but warm, and the nurse should avoid the common mistake of overloading the child with blankets to prevent him from "taking a chill." The right time for extra blankets is not when his temperature is above normal, but when it has fallen to sub-normal and he really is liable to chill owing to his resistance having been lowered by the recent fever.

In cases where the appearance of the rash is delayed there appears to be a special liability to lung complication, and it is well in these cases, therefore, to give the child a hot bath for about ten minutes, and then lay him between blankets. Sponging with hot water several times daily also tends to bring out the rash; at the same time it relieves restlessness and induces sleep.

The eyes should be bathed several times a day with warm boric lotion, and the child should be made to blow his nose, while the nurse should attend carefully to the condition of the mouth in the way detailed in the chapter on Scarlet Fever. The diet should be chiefly milk, diluted

with water; if there is diarrhœa, it may be citrated or peptonised.

The *complications* which arise are treated in the usual way. A steam inhaler is useful in laryngitis. For bronchitis a cotton wool jacket and an expectorant mixture are usually ordered, and the chest is rubbed with camphor liniment or other stimulating application. Linseed poultices are valuable in the early stages of broncho-pneumonia, and fresh air and good food are especially necessary in these cases.

V. Rubella (*Rotheln* or *German Measles*).

This highly infectious disease, which is quite distinct from measles, is of a very mild character. The incubation period is about eighteen days, and it is usual to isolate the patient for ten days.

There is often slight fever, coryza, and sore throat. The rash, which is generally the earliest symptom noticed, appears on the first day. It begins on the face and neck, and spreads to the body and limbs; the spots are larger than those of scarlet fever, and smaller and less raised than those of measles. It is often remarked that on the first day the rash resembles measles, and on the second day is more like scarlet fever. Apart from the rash, the most characteristic symptom is an enlargement of the glands in the sterno-mastoid, suboccipital, and mastoid regions; this sometimes gives rise to a sensation of stiffness of the neck, and may precede the rash.

The nursing is that of ordinary measles.

VI. Cerebro-Spinal Fever.

This disease is also known as *cerebro-spinal meningitis* or *spotted fever*, and in infants may take the form of *posterior basal meningitis*. It may occur in small localised out-

breaks, or in widespread epidemics; the young suffer most, males more than females. It is due to the *meningococcus*, which passes to the meninges from the naso-pharynx, and can be found in the cerebro-spinal fluid. It is most prevalent in the first half of the year, when confinement to the house is more usual. It was not uncommon among the soldiers during the Great War, and overcrowding was regarded as a contributing cause in these cases. The majority of the population is not susceptible, and in outbreaks some of the unsusceptible probably act as "carriers" of the germ in the naso-pharynx, the organism being expelled by coughing, sneezing, or speaking.

Symptoms.—The onset is sudden, with headache, vomiting, and pyrexia. Stiffness of the neck, head retraction, and general irritability develop. In infants there are convulsions, and the head retraction may be extreme. Hæmorrhagic rashes may occur, hence the name, "spotted" fever; herpes of the lip is also common.

The **Prognosis** is bad in infants and in persons over forty. About 30 per cent die if serum is used; about twice as many if it is not. Infants who recover usually show deafness (deaf-mutism), blindness, mental deficiency, or hydrocephalus. Adults may be left with paralysis.

Treatment.—Lumbar puncture is done early for diagnosis, and also to inject 10-40 c.c. of an anti-meningococcic serum after the withdrawal of a similar quantity of cerebro-spinal fluid. The serum before injection should be warmed to the body temperature, and the foot of the bed raised afterwards. The *nursing* is as for tuberculous meningitis. Nasal feeding is often required, and hot baths may be given for headache or excitement. The eyes generally require bathing.

VII. Encephalitis Lethargica.

This was first recognised in England in 1918, and its occurrence is now world-wide. It has been made com-

pulsorily notifiable, and in 1922 seventy-one cases were notified in London. The degree of infectivity is of a low order, and the majority of cases are sporadic—*i.e.*, single. It is characterised by progressive lethargy or stupor, generally with some ocular paralysis and a loss of expression in the face. From 20 to 50 per cent of the cases die, and recovery is often complicated by nervous sequelæ, such as tremor of the hands, lack of facial expression, a tendency to fall, wakefulness at night, and moral changes leading to mischievousness, &c. No specific treatment is yet available, but most cases require careful nursing.

VIII. Whooping-Cough (*Pertussis*).

Whooping-cough, like measles, is responsible for a large number of deaths among young children every year. It may attack young infants, and is most common at the age of four. It is most infectious in the catarrhal stage before the paroxysms are fully developed.

Incubation period varies from ten to fourteen days.

Symptoms.—These, to begin with, point to an attack of simple bronchitis, the child being feverish, out of sorts, and troubled with a hoarse dry cough. After this has continued for about ten days the characteristic "whoop" develops.

A paroxysm of whooping-cough begins with a series of short coughs, following one another so rapidly that there is no time for an inspiration. The child goes on coughing until the lungs are almost emptied of air. Then of necessity follows a deep inspiration, when the whoop is produced by the air being drawn in through the partially closed larynx. A second, or even a third, paroxysm may follow, after which the attack usually terminates with the expulsion of gas from the stomach and the vomiting of blood-stained mucus and food.

The whoop is not always present, nor is it necessary for a diagnosis of the disease. The characteristic feature is

the series of short rapid coughs without an intervening inspiration. A paroxysmal cough of this nature, especially if followed by vomiting, shows that the child has whooping-cough, even though it is never heard to whoop. The duration of the paroxysmal stage of the illness is very variable; it is usually six weeks, but may be several months.

Complications.—

(1) *Broncho-pneumonia* is responsible for the majority of deaths from whooping-cough.

(2) *Convulsions* are a very grave symptom.

(3) *Hæmorrhage* may occur from the nose, mouth, or lungs, but is seldom severe enough to give rise to anxiety.

Chance of Recovery.—The younger the child, the greater the risk. For infants under a year old it is a very serious ailment, owing to its exhausting character. Extensive broncho-pneumonia and convulsions are of extremely grave import.

Nursing and Treatment.—The child should be kept in bed in a warm room if the cough is very severe, or the temperature raised, and carefully sheltered from draughts, but free ventilation is very essential, especially if the child suffers from broncho-pneumonia. During a paroxysm it must be soothed and supported by the nurse.

The food must be light and nourishing, and as easily digested as possible, for not only is the patient exhausted by the frequent coughing, but it loses a certain amount of nourishment every time it vomits. It should therefore be fed as soon as it has settled down again after an attack, so that the stomach may have as much time as possible in which to digest and absorb the food before the next paroxysm of coughing comes on. For this reason it is advisable in severe cases to peptonise the milk.

Belladonna is the drug most frequently given in this disease, with a view to controlling the paroxysmal cough. Intramuscular injections of ether are also used. Cod-liver oil, tonics, and a change to the seaside are most useful in the convalescent stage.

Period of Isolation.—The patient is usually not

allowed to mix with other children for at least six weeks from the commencement of the paroxysms.

IX. Mumps (*Epidemic Parotitis*).

This is a widespread disease occurring among children, commonly between the ages of five and fifteen, boys being specially liable. It is prevalent in the winter and spring. The virus is unknown.

Symptoms.—The incubation period varies from twelve to twenty-six days; isolation is required for three weeks after the onset of enlargement of the glands.

The child is generally ill for a day or two before the salivary glands enlarge. The swelling of the parotid gland commences behind the jaw and below the ear; the gland is doughy and tender. At first it is unilateral, and the other side follows in one to five days. The submaxillary glands are usually enlarged also. In young adults the testicles are apt to become inflamed (*orchitis*), and atrophy may follow. Mumps usually lasts about ten days.

Treatment.—Rest in bed for ten days at least, with purgatives and mouth wash, is indicated. Glycerine and belladonna may be applied to the glands. In orchitis the testicles should be wrapped in cotton-wool and supported.

X. Influenza.

This disease, which has been attributed to *Pfeiffer's bacillus*, occurs in widespread epidemics, and is characterised by the variability of its symptoms, which are apt to be followed by a nervous stage. Several **Types** are recognised:—

(*a*) *The General Febrile Type*, the onset of which is abrupt, with severe headache and pain in back and bones; bronchitis and conjunctivitis are common, and prostration rapid; the fever lasts three to five days, and relapses are common.

(*b*) *The Respiratory Type,* in which bronchitis, pleurisy, empyema, and pneumonia occur. It is the most fatal form.

(*c*) *The Nervous Type,* in which there is prostration with headache, insomnia, or delirium.

(*d*) *The Gastro-intestinal Type,* which is rare, and commences with abdominal pain, and profuse diarrhœa or vomiting.

Sequelæ.—Psychical sequelæ, such as insomnia, loss of taste and smell, and neurasthenia, are common. Chronic bronchitis, cardiac weakness, and otitis media also occur.

Treatment.—The patient should stay in bed until the temperature has been normal for several days. Quinine or aspirin may be given. The bowels should be kept open. The insomnia or cough may require treatment. Change of air is useful in convalescence.

CHAPTER XXVI.

TUBERCULOSIS.

TUBERCULOSIS is a general disease due to the action of the tubercle bacillus, which, while manifesting itself with more or less prominence in a particular organ, exerts its toxic influence throughout the system.

There are two principal types of tubercle bacilli recognised, the *human* and the *bovine*. In nearly all cases of pulmonary tuberculosis the bacilli are of the human type; in non-pulmonary tuberculosis they may be of either type, the bovine variety being much more frequent in children than in adults, particularly in glandular tuberculosis.

Causation.—Owing to the large number of deaths which it causes every year, tuberculosis is one of the most important and fatal diseases with which we have to deal. Its widespread character is due in part to the fact that the sputum of phthisical patients contains myriads of germs, which are scattered broadcast owing to the careless and uncleanly manner in which so many people expectorate, and are consequently frequently inhaled with the dust. It must be remembered that the expectoration of patients suffering from pulmonary tuberculosis, the discharges from tuberculous abscesses, and the urine of those suffering from tuberculosis of the bladder, &c., are all sources of infection, and should be disinfected. Tubercle bacilli are also found in milk, since cows too are subject to tuberculosis.

An opinion now often held is that infection with the

tubercle bacillus is almost universal, the infection being acquired in most cases in childhood. In only relatively few of those infected, however, does tuberculous disease manifest itself, and, according to this theory, when this does occur its appearance is to be attributed to something which has lowered the general health (*e.g.*, overcrowding, deficient ventilation, want of proper food, overwork, influenza, &c.), and has thus reduced the resistance of the tissues to the bacilli already present in them.

Prevention.—Causes of a lowering of the general health, such as those specified above, should be avoided as far as possible. Especially is abundance of fresh air, both by day and by night, a safeguard against the disease. The preventive measures now being taken in this country may be summarised as :—

1. *The compulsory notification of tuberculosis.*—The house is visited by a health officer, and the patient is advised as to his mode of life, the importance of ventilation, and the risk of infecting others. Other members of the family are inspected, and contacts are sent for examination to the local tuberculosis dispensary in order that the disease may be detected in the earliest stage. Sputum-testing and house-disinfection are undertaken free of charge.

2. *The establishment of sanatoria,* where patients are not only treated but taught how to avoid spreading infection.

3. *The diffusion of knowledge* by leaflets and lectures—*e.g.*, as to the objection to spitting in public places, the value of the open window, the importance of washing the hands before eating, the need for the sterilisation of milk, &c.

4. *The supervision of dairy farms and milk-shops.*—Endeavours are being made to exclude tuberculous animals from the herds.

Pathology.—The germs settle in a region—*e.g.*, the upper part of the lungs—where they give rise to minute areas of inflammation called *tubercles.* These gradually increase in size, and, if the disease is unchecked, they, and

the tissues in which they are deposited, become converted into cheesy masses, a process which is known as *caseation*. The caseous material may either (*a*) soften into tuberculous pus, or (*b*) become calcified, the latter constituting one form of arrest of the disease.

On the other hand, in more favourable cases, caseation either does not occur or does not progress, and new fibrous tissue forms and completely encloses the tubercles. This process of *fibrosis* is the second and more satisfactory mode of arrest.

The terms "quiescent" and "arrested," so generally used, do not mean that the disease is cured. The former is applied to cases which have no symptoms of tuberculosis and no signs of tuberculous disease, except such as are compatible with a completely healed lesion, and in which the sputum is free from tubercle bacilli. The term "arrested" is applied only to cases which have been "quiescent" for a period of at least two years.

I. Pulmonary Tuberculosis.

Forms.—(1) *Acute miliary tuberculosis*, which is usually part of a generalised tuberculosis. The lung is riddled with tubercles, and death ensues before any secondary changes occur.

(2) *Caseous tuberculosis*, in which there are caseous patches scattered throughout both lobes. Softening rapidly produces small cavities which run together. This form is popularly called "galloping consumption," and is marked by a high remittent type of temperature.

(3) *Chronic*, or *fibro-caseous, tuberculosis*, the commonest form, in which the oldest lesions show extreme fibroid change, while in other parts caseous areas are softening to form new cavities. The symptoms are described below.

(4) *Fibroid tuberculosis*, in which fibrosis predominates. It includes all grades from small arrested lesions to those in which fibroid changes have followed caseation and ex-

cavation. In the latter case there may be marked contraction of the side of the chest. There is almost complete absence of fever, and in advanced cases the extensive area of the lungs involved is often in striking contrast with the apparent wellbeing of the patient.

Symptoms.—These, to begin with, consist of anæmia, lassitude, loss of appetite, and a constant dry cough, accompanied by gradual wasting, and a slight rise of temperature in the evening. As the disease advances and cavities form in the lungs, emaciation becomes marked; purulent expectoration, night sweats, and a hectic temperature are added to the other symptoms. Hæmoptysis, or blood-spitting, may supervene at any period of the illness, though it is more common in the later stages, when blood-vessels are likely to be opened by the breaking down of the lung tissue.

Complications.—*Pleurisy* frequently precedes or accompanies consumption. It is commonly "dry," but may give rise to a considerable effusion of fluid, which may require aspiration. A purulent effusion, or *empyema*, is infrequent in tuberculosis. Pleurisy is indicated by pain, which may be relieved by poultices, leeches, painting with tincture of iodine, or the application of strapping.

Pneumothorax (*i.e.*, the presence of air in the pleural cavity) may arise owing to a communication forming between that cavity and a tuberculous cavity. It occurs when the disease has extended so rapidly that there has been no time for the pleural thickening and adhesion which usually occur to take place. The symptoms are sudden severe pain, great difficulty in breathing, and shock. Sometimes the patient dies in a short time, sometimes he recovers.

Tuberculous laryngitis, *enteritis*, and *meningitis* are not uncommon complications of consumption. *Anal fistula* is a troublesome complication which requires surgical treatment. *Mental derangement*, occasionally leading to suicide, may also occur. *Hæmoptysis* is described later.

Treatment.—In the febrile stage the treatment resembles that of other febrile illnesses. Cough is relieved

by lozenges, a warm drink, or inhalation of steam from boiling water to which friar's balsam is added, or a linctus may be used. In chronic pulmonary tuberculosis the essentials are life in fresh air, nourishing diet, rest, and regulated exercise.

1. **Fresh Air.**—It is not necessary that the patient should sleep out, but the windows of his rooms should be open day and night, and not closed for cold or rain, or for fever, cough, or other symptoms. He must never feel cold, and should be sufficiently warmly clad to prevent this.

2. **Diet.**—The patient who is undergoing treatment in a sanatorium is provided with a plain but nourishing diet containing an adequate amount of fatty foods, care being taken that the stomach is not taxed beyond its digestive capacity. It is now recognised that no good can result from stuffing him to such an extent that he puts on fat. At the same time, it is very important that he should take a proper amount of food; consequently, in a sanatorium most careful attention is paid to the way in which the meals are taken, since loss of appetite is one of the symptoms which suggest that a patient has over-exerted himself. The importance of an hour's complete *rest* before the midday and evening meals must be emphasised. It prevents fatigue, allows the increased temperature produced by exercise to subside, and prepares for digestion.

The *well-to-do patient* who is treated at home should follow strictly the same regulations for meals that obtain in a sanatorium, and nothing should be taken between meals. *Among the poorer classes* the question of obtaining sufficient food is often a difficult one, but there are many cheap articles of diet, such as suet puddings, haricot beans, lentils, porridge, skimmed milk, dripping, herrings, and Dutch cheese, which contain a large amount of nourishment, and it is one of the duties of a dispensary or district nurse to explain their value to her patients. No increase of milk over that normally taken is really needed. It is often difficult to convince a patient that an ordinary diet is more suited to his condition than one consisting of milk

and eggs. In more advanced cases, no attempt should be made to force the appetite and give the stomach more than it can comfortably deal with, or indigestion will result, but the patient's tastes should be consulted as much as possible.

3. **Rest.**—The early symptoms of fever, headache, and malaise are due to the toxins which enter the circulation from the lesions in the lungs. The more active the circulation in these organs, the larger the quantity of toxins which is washed out of the areas of disease, and, as a result, the more marked will be the symptoms until the patient's tissues are protected against the harmful effects of these substances. The presence of the symptoms just mentioned tells us that a larger dose of the tuberculous toxins has entered the circulation than the tissues can at present tolerate. Our *primary object,* therefore, is to reduce the rate of blood-flow in the lungs as far as possible by complete rest, and thus to diminish the output of toxins. During this period of rest the patient's tissues are stimulated by the toxins which are circulating in them to produce certain substances which as a class are called " antibodies," since they tend to neutralise the action of the bacillary poisons, just as the tissues of a horse are stimulated to produce diphtheria antitoxin by injecting the animal with diphtheria toxin.

4. **Graduated Exercises.**—When the early symptoms have entirely disappeared under the influence of complete rest, the patient is put through a course of carefully graduated exercises by means of which the activity of the pulmonary circulation is very slowly and gradually increased. This treatment induces a correspondingly gradual increase in the quantity of toxins passing into the circulation from the diseased areas in the lungs (*auto-inoculation*). Provided this increase is sufficiently slow, the tissues will be able to meet it by an equivalent increase in the antibodies they are making ; in other words, our object is so to regulate the amount of toxin entering the circulation that there is sufficient to stimulate the defensive forces of the body, but not enough to overcome them and paralyse their activity.

If this object is achieved the toxins will be neutralised, and there will be no symptoms. By thus gradually educating the tissues to protect themselves, that is to say, by increasing their resistance, they will in time tolerate an amount of toxin which earlier in the treatment would have produced marked symptoms.

All patients suffering from pulmonary tuberculosis are not suitable for such treatment. It can only be used in cases that are free from fever and not confined to their beds. *Cases that are febrile* on admission remain in bed at absolute rest until their temperatures are normal. They must neither talk nor read, nor move about in bed. Coughing should be restrained as much as possible, and no visitors allowed. After a period of absolute rest the temperature becomes normal, and the patient is then allowed to have a paper or a book and be propped up in bed. A few days later sitting up in bed is permitted for a short time. If the temperature does not rise, this time is increased each day until he is allowed to be up in clothes. The next stage is gentle exercise in the shape of a short walk at a slow pace. This is gradually lengthened, until finally the patient can cover as much as four miles at a time without any ill-effects resulting.

5. **Graduated Labour.**—In some sanatoria he now begins a course of graduated outdoor labour in the sanatorium grounds. His task at first is a very light one, such as carrying a small quantity of earth or stones in a basket for a short distance. This he does a sufficient number of times to walk a certain number of miles each day. If he is able to perform this task for a week without any return of his early symptoms, or without feeling tired, the amount of work which he does is slightly increased, and so on very gradually week by week until at the end of three or four months he can do several hours' heavy work each day without feeling any the worse for it.

Should there be at any time during this period of graduated labour a return of such symptoms as fever, headache, loss of appetite, or a marked increase in the amount of expectoration, the patient at once returns to bed and

remains there at absolute rest until the symptoms have completely disappeared. An hour's rest before the midday and evening meals is strictly enforced for all patients who are up in clothes, unless they are on the eve of being discharged.

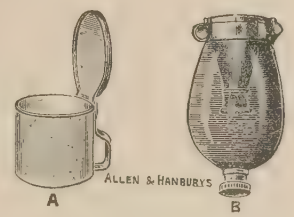
It is obviously advisable that the work which is done by sanatorium patients should have a useful object, apart from its effect on the workers, otherwise they cannot be expected to take a proper interest in it, lacking which they will carry it out perfunctorily. Graduated labour is beneficial for the mind as well as the body. Without it prolonged residence in a sanatorium tends to induce a listless lazy habit which is most demoralising. The maintenance of discipline among the inmates, and their consequent strict observance of all rules and instructions, is absolutely essential to the success of a sanatorium.

All cases are not suitable for graduated labour, however, and care has to be taken in selecting patients for it.

6. **Sanatorium Treatment.**—On arriving at the sanatorium the patient is kept in bed a few days, so that the resting temperatures may be recorded. Patients with pyrexia remain in bed till this has subsided. The daily routine is usually as follows :—

7.30 A.M.—Temperature taken when called ; bath, if permitted.
8.30 A.M.—Breakfast.
9 to 9.30 A.M.—Rest, reading, or mild recreation.
9.30 A.M.—Visit of doctor. The day's programme is given to each patient ; it may be rest, a walk of given length at a stated rate, or a specified grade of labour.
12 to 1 P.M.—Rest hour, which is spent on a couch or bed in shelter or verandah, or in the open. Reading is usually allowed, but not speaking, writing, or working.
1 P.M.—Dinner. After this, rest, reading, or mild recreation till 2.30 P.M.
2.30 to 4.30 P.M.—Rest, exercise, or work, as prescribed.
4.30 P.M.—Tea. After this, rest or mild recreation again till 6 P.M.
6 to 7 P.M.—Rest hour.
7.15 P.M.—Supper, followed by music, singing, &c., till 9 P.M.
9.30 P.M.—Bed.

Each patient is provided with his own sputum-flask and mug, which are cleared and sterilised by boiling every morning. He is also given a clean handkerchief each day, which he should always hold in front of his mouth when coughing or sneezing, and which he carries, not in his pocket, but in a small bag made for that purpose. The handkerchiefs are collected daily and taken straight to the laundry. Patients are strictly forbidden to expectorate anywhere except into the proper receptacles. Expectoration received into a handkerchief will in time dry and be distributed as dust. Paper handkerchiefs which can be burnt are sometimes used.



A. Spitting Mug. B. Sputum Flask for pocket.

In most sanatoria the temperature is taken in the rectum. It is generally sufficient to record it four times in the twenty-four hours: (*a*) on waking in the morning (at 7.30 A.M., the temperature in the mouth is normally 97°-98° F., and in the rectum 97.2°-99°); (*b*) at 1 P.M., after the rest-hour following the morning's exercise; (*c*) at 6 P.M.; and (*d*) at 9.30 P.M., after the patient has gone to bed. Patients who are up are weighed every week.

In general, the stay should be from not less than six months to a year or more. Few patients can afford to stay until arrest is complete, but the routine learned can be carried out at home. When a patient leaves a sanatorium, he should always bear in mind that he probably has a quiescent focus of disease in his lungs which may again become active and lead to a return of his symptoms, should he at any time become run down in health so that the resistance of his tissues is lowered sufficiently to allow the tubercle bacilli in the focus to gain the upper hand. Such a patient ought, therefore, to take especial care of himself when he is subjected to any serious mental or physical strain, or

when he is laid low by illness, while he should do his utmost at all times to avoid excessive fatigue.

Tuberculosis Colonies.—Colonies and workshops are advocated for post-sanatorium cases with a good prognosis as providing a natural transition from the exercise treatment to the resumption of normal life, for if a worker returns directly from a sanatorium to an unhealthy home or occupation he is almost sure to relapse. Work as an agricultural labourer is usually too hard, and in the colony he preferably works at his old trade but under the best hygienic conditions. It is estimated that about 80 per cent of the colonists should be able to provide for themselves on leaving. For the remaining 20 per cent, who cannot return to outside normal life, some form of permanent industrial settlement on the estate is suggested, where men can be allotted cottages and be joined by their families.

7. **Treatment at Home.**—In a private house *the well-to-do phthisical patient* should be given a bed to himself in a bright cheery room of ample size with a south or south-east aspect, the windows of which should always be kept widely open. His clothing should be sufficiently warm during the colder months to prevent him feeling any discomfort from the free ventilation which is so essential a part of the treatment. He should have his own towels and eating utensils. Handkerchiefs, when soiled, should be placed in a pail containing disinfectant, to avoid the danger attaching to dried particles of sputum. Coughing should be restrained as much as possible, and a spit-mug and pocket sputum-flask should be used. As to the disposal of sputum, see p. 399. Similar precautions should be taken with a phthisical patient treated in a general ward.

Where possible, the same principles that obtain in a sanatorium govern the treatment of the consumptive who remains at home. If an early case, the patient remains in bed at absolute rest until fever, headache, and excessive cough have disappeared, and then begins very gradually to take walking exercise. Instead of the graduated labour tasks, he takes longer and longer walks until he is

able with comfort to cover twelve to fourteen miles a day, after which he may work in the garden or play golf, always providing that he does not feel tired when he has completed the prescribed amount of exercise. An hour's rest should always be taken before the midday and evening meals, while an immediate return to bed is called for by the return of fever, headache, or loss of appetite. The temperature should be carefully taken in the mouth on waking, and again in the evening.

Among the working classes the home treatment of phthisis is naturally carried out under less favourable conditions, for it may be impossible to give the consumptive a room to himself, and no easy matter to get him a separate bed. The dispensary nurse must use the utmost tact in explaining how the patient's chance of recovery will be increased by clean and airy surroundings. The importance of sunlight as a disinfectant should be emphasised, and a thorough daily dusting of the living rooms with a damp cloth advised. She should tell him of the children who live in open verandahs all the year round, and in consequence recover from tuberculous disease. Should the patient reside in a smoky or dusty district, or in one that is subject to fog, a sheet of muslin stretched across the open window will considerably diminish the irritating effect of such an atmosphere. He should be warned particularly against the danger which attends fatigue, that, knowing the risk, he may, so far as possible, guard against it, while the dangerous character of his expectoration, especially in the dried state, should be duly impressed on him. To dispose of it safely and unobtrusively is often a very difficult problem. Sucking pen or pencil tops, and moistening the finger to turn over a leaf, may lead to the infecting of others

8. **Treatment of Advanced Cases.**—It would be useless, and even harmful, to submit to the régime of a sanatorium patients in whom the disease had made such progress that there was little or no prospect of ultimate recovery, though in some it might be possible for a time to produce considerable improvement. They should be given

an abundance of fresh air, while the same care will, of course, be taken in dealing with their sputum. The continuous wearing of an antiseptic inhaler sometimes effects a considerable improvement in the symptoms, and it should be tried in all stages of the disease when the cough is troublesome.

If *night sweats* are very marked, sponging the patient with tepid water containing a small quantity of eau-de-Cologne or spirits of lavender is very refreshing to him. Ventilation of the sleeping apartment should not be diminished on account of this symptom, but, if possible, increased. Fresh air is the best cure for night sweats. In the later stages of the illness, when emaciation and weakness are extreme, great care must be exercised in guarding against the occurrence of *bed-sores*. Hot drinks are useful when the *cough* is dry and frequent.

9. **Treatment by Tuberculin,** which in one form or another has been largely used in pulmonary tuberculosis, was originally introduced by Koch in 1890. Its advent gave rise to great anticipations which were grievously disappointed, while in not a few cases disaster followed its administration. These untoward results were caused by ignorance of the potent character of the remedy. In consequence it fell into complete disfavour, and its use was abandoned.

During the last few years new forms of this remedy have been prepared. There are several varieties, each of which may be prepared from tubercle bacilli taken from a human or a bovine source. The latter is indicated when the first letter of the series designating the preparation is P. For example, T. R., which is Koch's new tuberculin, is prepared from human, and P. T. R. from bovine bacilli. Another preparation is B. E. (Koch's bacillary emulsion), which is a true bacterial vaccine. T. (Koch's old tuberculin) is a solution of the toxins which are excreted by the bacilli during the process of growth. The most recent is Professor Dryer's "Diaplyte" vaccine; it is an emulsion of dead tubercle bacilli, which have been stripped of their

fatty envelope in the hope that thereby they are made more effective in the production of antibodies from the patient's tissues.

The object of injecting tuberculin is to excite the patient's tissues to produce more of the antibodies already mentioned. Such an injection has therefore the same object as graduated exercise, and too large a dose, like too much exercise, will be harmful to the patient.

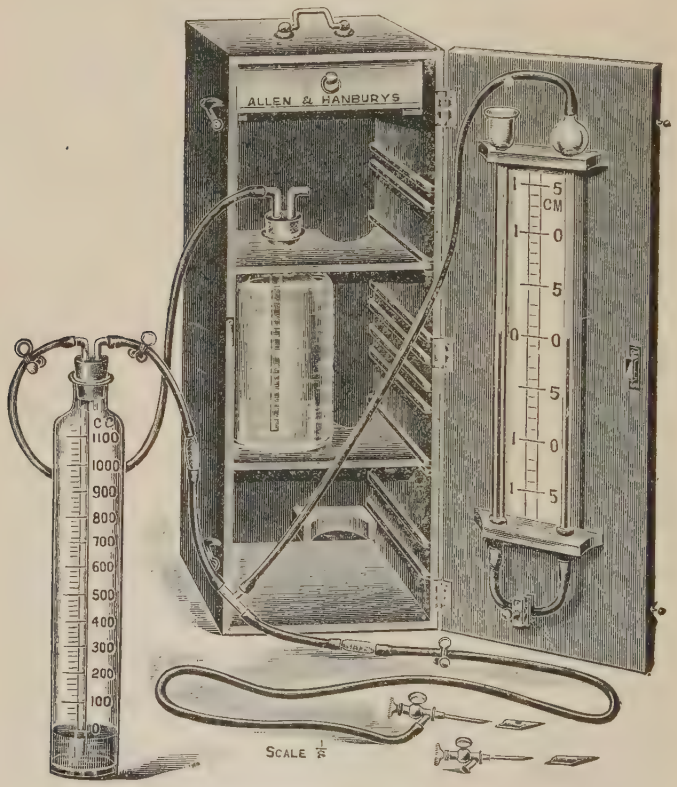
Reactions caused by tuberculin may be "local," for example, redness at the site of injection; "focal," *i.e.*, increased activity at the focus of disease, giving rise, for instance, to an attack of pleurisy; or "general," causing pyrexia, loss of appetite, and a fall in weight. The dosage should be so regulated that focal and general reactions are avoided.

10. **Treatment by Artificial Pneumothorax** is generally reserved for patients with advancing disease associated with fever, in whom the active lesions are practically unilateral, and for cases of severe or recurrent hæmorrhage. It is not employed in early cases, in those progressing favourably, or in those with extensive signs on both sides.

The principle is to introduce sterile air or nitrogen into the pleural cavity, producing collapse of the affected lung, and keeping it at rest by repeated refills. In successful cases the temperature rapidly falls to normal, cough and expectoration diminish, and the patient is able to take exercise. The apparatus consists of a special needle; two bottles, one containing nitrogen or air, the other containing water, the two being connected by rubber tubing, and so arranged that water can flow down and displace the gas; a water manometer to measure the pressure; and a three-way stopcock and tubing. At the first injection pleural shock or gas embolism may occur, or the method may fail owing to adhesions preventing the lung from collapsing.

11. **Treatment of Hæmorrhage.**—This, if at all profuse, is a very alarming complication, and likely to tax

severely the presence of mind of the nurse. If profuse it comes from a blood-vessel in the wall of a cavity. Hæmoptysis may prove fatal at once, either from the severity of



Apparatus for the production of Artificial Pneumothorax.

the hæmorrhage, or from suffocation, the bronchial tubes of both lungs becoming filled with blood.

The patient must be kept perfectly quiet, if possible, in the semi-recumbent position, the nurse doing her best to allay his alarm. If she has been told from which lung the

hæmorrhage is likely to come, she should place the patient on his side with that lung undermost, to prevent, as far as possible, the flooding with blood of the tubes of the other lung. Perhaps the best form of local application, and one that can at once be obtained, is a hot bottle or large fomentation to the abdomen. It does good by drawing blood from the lungs into the large abdominal vessels. No food or drink should be given to the patient until the doctor has seen him, though he may be allowed a very little ice to suck, as that assists in moderating a too violent cough which might disturb any clot that is forming in the mouth of the bleeding vessel. The nurse who has charge of a case of phthisis should always obtain clear instructions for her guidance in the event of hæmoptysis coming on. Nitrite of amyl is sometimes used, as it acts immediately by causing a general dilatation of the arteries, and so lowering the blood-pressure in the lungs. The small glass capsule containing it is broken in a handkerchief and the drug inhaled.

12. **Treatment of Night Sweating.**—Night sweats are much less common since the importance of fresh air and free ventilation has been recognised. The amount of bed-clothes should be regulated. Dr Paterson recommends placing a grass mat over the mattress and under the sheet on which the patient lies, or else sleeping on canvas without a mattress. Sometimes it is helpful, before settling the patient down for the night, to sponge him with hot or tepid water to which toilet vinegar has been added, and to have a second suit of night-clothes ready warmed for him to put on after he has been dried.

The Use of Tuberculin in Diagnosis.—(*a*) *Von Pirquet's cutaneous reaction* is positive, not only in active tuberculous lesions, but also in healed ones. It is therefore of most value in children, in whom a negative reaction shows absence of tuberculosis. A drop of tuberculin is placed upon the surgically clean skin, which is scratched through it as in vaccination; an inflammatory reaction following is reported as positive. A control scratch through sterile saline solution is made at the same time.

(*b*) *The injection of old tuberculin* is followed by a febrile reaction in tuberculous subjects. This test is not applied if the diagnosis can be made in other ways, for its use is not free from risk.

(*c*) *Calmette's reaction*, in which a tuberculin solution is dropped into the conjunctival sac, and *Moro's reaction*, in which a tuberculin ointment is rubbed into the skin, are not often employed now.

Sputum Examination.—Sputum intended for examination should be collected in a sterile vessel after the teeth have been thoroughly cleaned with a toothbrush, and the mouth well washed out with water. The sputum coughed up the first thing in the morning is the most desirable for examination; an overnight dose of 10 grains of potassium iodide leads to its liquefaction, which facilitates the detection of tubercle bacilli.

In *children* the sputum is always swallowed until the age of six or seven. Sufficient sputum may usually, however, be procured by passing the tongue depressor back so as to touch the epiglottis or pharynx, and so start a cough. Any expectoration that is brought up is thrown on the pharyngeal wall, and may be collected on a sterile throat swab before the child has time to swallow it. Older children may be taught to expectorate.

II. Non-Pulmonary Tuberculosis.

Non-pulmonary tuberculosis is more common in children than in adults, and may affect the bones and joints (p. 581 *et seq.*), lymph-glands (p. 381), peritoneum (p. 284), genito-urinary organs (p. 290), skin (lupus), and meninges (p. 305).

CHAPTER XXVII.

SURGICAL INFECTIVE DISEASES.

I. Syphilis.

Syphilis is a specific infectious disease, the actual cause of which is an extremely minute animal organism, called the *spirochæta pallida*. The disease may be acquired or congenital. The consequences resulting from an accidental acquirement of it are so disastrous that nurses should be made aware of the risk they run when attending on a case of syphilis, and the precautions they should observe. An untreated case of acquired syphilis passes through three stages.

(*a*) **Primary Stage.**—In this stage syphilis is a local disease, showing itself as a small hard papule, which appears about a month after inoculation. This develops into an indurated sore, called a *hard chancre*, with enlargement of the neighbouring lymphatic glands. In the course of a few weeks the primary sore disappears.

(*b*) **Secondary Stage.**—May manifest itself while the primary sore is still present, or very shortly after it has cleared up. In this stage the disease affects the system generally, and is marked by various constitutional symptoms —ulcers on the tonsils, sores in mouth, iritis, loss of hair, a rash (which is often ham-coloured and does not itch) and the formation of soft warty masses (*condylomata*) in regions where the skin is moist, *e.g.*, vulva and anus.

(*c*) **Tertiary Stage.**—No fixed interval of time elapses

between this and the preceding stage ; it varies from three to many years. The disease is very irregular both in its manifestations and the times of their appearance. It is now prone to localise itself in the tissues ; it may be in the bones, liver, central nervous system, &c. A characteristic feature of this stage is the *gumma*, which is a firm swelling, with contents of a dirty yellow colour and cheesy consistency. Tertiary symptoms may appear soon after the termination of the secondary stage, or the patient may remain in good health for many years, and then die from a chronic disease of the nervous or circulatory system. Locomotor ataxy, general paralysis of the insane, and aneurism of the aorta are generally sequelæ of syphilis acquired earlier in life.

This short account is sufficient to show what an extraordinary disease syphilis is, both in the variety and multiplicity of its symptoms, and in the later stages in the irregularity of their appearance.

Treatment.—During the primary stage the discharge from the sore which forms at the seat of inoculation is very infectious. In the secondary stage, when the poison is diffused through the system, this is also true of any secretion or discharge connected with a syphilitic lesion, as, for example, the saliva when there are sores in the mouth. During these two stages the nurse must be very careful to avoid infection. When dressing a sore she ought to wear rubber gloves, since infection might enter through an almost imperceptible crack in the skin. Everything used in such a case should be marked and kept separate for that patient, while dressings should at once be burnt and bedding be disinfected. In the tertiary stage, the risk of infection is very slight. While guarding herself, the nurse must never forget the other patients, but take every precaution against infecting one of them.

The great object of treatment in this disease is that it should be early enough and efficient enough to stay the action of the poison on the system, and so prevent the occurrence of the later and more serious results of infection.

Until a few years ago mercury was *the specific* for the primary and secondary stages, and iodide of potassium for the tertiary. During recent years various compounds of arsenic have also been tried, the method of administration being by injection into the circulation or the tissues. There are now quite a number of the compounds, such as salvarsan (606 or kharsivan), neosalvarsan, galyl, &c. The patient should have a saline purge on the day of the injection and on the day following it.

It is usual to give a course of about eight injections of an arsenic compound and mercury, repeating after intervals of three months until the *Wassermann reaction* for syphilis is negative, after which one more course is given. The Wassermann test is then applied every three months for two or three years, and further courses given should it again become positive.

Congenital Syphilis.—This may manifest itself at birth, or, more commonly, a few weeks later; during the second dentition it often reappears as late congenital syphilis.

At birth the infant may appear healthy, or it may be wizened with pustules on its hands and feet. *A few weeks after birth* the apparently healthy infant may develop snuffling (owing to rhinitis), fissures about the lips, and a raw-bacon-like rash on the buttock and thighs, with condylomata at the anus. Treatment is by mercury in the form of grey powder or inunction, together with intramuscular injections of neosalvarsan.

Late congenital syphilis is evidenced by a characteristic facial appearance (bossed forehead, muddy complexion, depressed bridge of nose, and striæ at the corners of the mouth), Hutchinson teeth (permanent central incisors notched and peg-shaped), and interstitial keratitis (inflammation of the cornea). Permanent deafness, due to changes in the internal ear, painless synovitis of the knees, or periostitis of the tibiæ may also occur.

II. Gonorrhœa.

Gonorrhœa is a specific infectious disease of the genital tract, due to a micro-organism called the *gonococcus*.

The germ is sometimes carried by the blood to other parts of the body, most commonly to a joint, which in consequence becomes acutely inflamed; less often it affects the heart, producing a dangerous form of cardiac disease. It may also spread by continuity to the epididymis in males, and the uterus, Fallopian tubes, and ovaries in females. Gonorrhœal conjunctivitis sometimes occurs; it is particularly serious in new-born infants (*ophthalmia neonatorum*), in whom it is a common cause of blindness.

In young girls especially, infection may follow contact with infected articles, such as closet seats, napkins, towels, &c. In children's wards the greatest care must be taken to prevent the transmission of infection to other patients, and it is wise to isolate all cases of vulval discharge, whether gonorrhœal or not.

In men the purulent discharge from the urethra begins after an incubation period of usually three days, and lasts a varying time, generally a few weeks; sometimes a trace (*gleet*) persists even for years. In women the disease is often so mild as to pass unnoticed; the cervix and the urethra are the parts most affected.

Treatment.—Rest is essential. The urine should be made as dilute as possible by giving large quantities of bland drinks, and the bowels should be kept open. Local treatment usually consists in antiseptic irrigation, or in women in the application of antiseptics to the urethra and cervix.

Vaginal Discharges.—This subject is dealt with more fully in the section of Gynæcology. Although not more than a small proportion of the cases of vaginal discharge are caused by the presence of the gonococcus, all are contagious. The nurse must bear constantly in mind what a very serious accident it would be if she infected herself or

one of the other patients. As regards herself, the danger is chiefly in connection with the eyes, gonococcal ophthalmia being a most serious complaint.

In wards containing a number of little girls it sometimes happens that there is an outbreak of vaginitis, several of the children being affected. Such an outbreak is often due to want of care on the part of the nursing staff. Either the presence of the primary case in the ward has been overlooked, or adequate precautions have not been taken to protect the other children. The most careful cleansing of the hands, the sterilising of everything which may possibly have been infected, and the marking and keeping separate of all utensils required by the patient who has vaginitis, should prevent any spread of the infection. No patient suffering from vaginal discharge should be allowed to use the same bath as the other inmates of the ward.

Ophthalmia Neonatorum, or ophthalmia of the newborn, is a most serious condition, since it is responsible for one-fourth of all cases of blindness. Most of these cases of ophthalmia, including all those which lead to loss of sight, are due to the gonococcus. There may be no obvious sign of its presence in the mother. The possible danger is greatly lessened if proper precautions are taken by the nurse. Infection is not likely to happen before the head is born, since the eyes are tightly closed and also protected by a layer of the vernix caseosa while passing through the vaginal canal. But as soon as the child is born, it opens its eyes, and there is then a possibility that it may rub them with its hands and so infect them. To anticipate such an occurrence the nurse ought, as soon as possible, to cleanse the eyelids with a piece of soft clean rag and warm boric lotion, or plain warm water, taking care that the rag is not too wet, or some of the lotion may trickle into the eye and cause the very condition she is striving to avert. At the same time the child's hands and arms should be washed. When subsequently bathing it, the nurse must use clean water for its face, and not sponge

the head with that in which she has washed the body, or she may infect the eyes. Should there be any reason, such as the presence of vaginal discharge, to anticipate danger to the child from the gonococcus, the nurse should cleanse its eyelids without opening them directly the head is born. In such a case the doctor will probably instil into its eyes one or two drops of a 1 per cent solution of nitrate of silver, to kill any germs that may chance to have entered them.

The first symptom of gonorrhœal ophthalmia appears about three days after birth as a slight redness of the conjunctiva. This quickly increases in intensity, accompanied by much swelling of the lids and profuse discharge, which quickly becomes purulent. In unfavourable cases the cornea ulcerates and finally gives way, allowing the contents of the eyeball to escape. The result is total blindness. In less severe cases there is recovery with scarring of the cornea, and consequent defect of vision. In mild cases, and in most of those which are treated early and efficiently, the condition subsides without any permanent damage to sight.

Treatment.—It must be obvious from what has been said that only the most unremitting and skilful attention on the part of both doctor and nurse can save from blindness an infant who has a well-marked attack of gonorrhœal ophthalmia. Both eyes are usually affected, and it is essential that they should be frequently and, as far as possible, thoroughly cleansed from discharge. The age of the patient and the swollen and stiffened condition of the lids render this part of the treatment far from easy. The lids must be gently separated and the discharge washed away with a stream of warm boric lotion squeezed from a pledget of absorbent wool, care being taken not to exert any pressure on the inflamed and possibly softened eyeball. This will be done at least every two hours, both day and night. The nurse should not bend over the child when separating the lids, or pent-up discharge may spurt into her own eyes. It is hardly necessary to say that the

hands must be most carefully cleansed each time the eyes of such a case receive any attention. If a nurse lifts in her arms a child suffering from ophthalmia, she should take care that it does not infect the bib of her apron, or she may be the means of conveying the disease to another patient. Preferably she should wear overalls and goggles.

III. Erysipelas.

Erysipelas is an infectious disease, due to a special micro-organism, the *streptococcus* of erysipelas, which sets up an acute spreading inflammation of the skin. The incubation period is one to four days.

Symptoms.—Erysipelas either starts in the neighbourhood of a wound, or else it may appear where no obvious injury of the skin can be detected. It is probable that even in these cases some slight abrasion is really present. In cases of facial erysipelas, the margin of the nostril and the inner angle of the eye form favourite starting-points. The illness frequently begins acutely, with headache, vomiting, shivering, and a high temperature. In a few hours the eruption appears, the skin becoming red or purple in colour. As the rash spreads, the skin takes on a tense, swollen, shining appearance, which is accompanied by tenderness and a burning sensation. Blebs frequently appear on the surface. The margin is both to sight and touch distinctly raised, and this is a characteristic feature of the eruption.

The temperature is irregular, and ranges high. At the end of about a week it falls, usually by crisis. At the same time the rash begins to fade. Albuminuria is generally present. In severe cases the temperature keeps up, and the patient falls into a typhoid condition, with low muttering delirium. Recovery is then very doubtful.

Nursing and Treatment.—No one should take charge of a case of erysipelas who has any cut or abrasion of the skin, otherwise she may very possibly catch it herself. Any cut or crack that develops while she is on duty should

be at once protected by collodion. The nurse should wear rubber gloves, and always wash her hands after attending on the patient; she should at once burn any dressings that have been removed from an infected wound.

While the temperature is raised, the diet should consist of milk and beef-tea, the patient being kept in bed in a warm room. Some cases are treated successfully by means of hypodermic injections of antistreptococcic serum. The affected area should not be wetted, but dusted with powder. Strong solutions of silver nitrate or iodine may be painted at the margins of the rash to check the spread of inflammation.

IV. Tetanus.

Tetanus, or lockjaw, is due to a bacillus which probably exists widely distributed in dust, dirt, and soil. During the Great War tetanus infection of wounds was common, and rendered necessary the routine administration of anti-tetanic serum to the wounded at the earliest possible moment. The incubation period is very variable, commonly eight to twelve days.

The first symptoms are difficulty in swallowing and stiffness of the neck; later spasms occur affecting the masseters, the back of the neck, the abdominal muscles, and then the muscles of the back and limbs. Tonic spasm makes the muscles rigid, with paroxysmal increases of spasm accompanied by agonising pain. The mortality is from 45 to 70 per cent, death usually occurring within seven days from exhaustion.

Treatment consists in rest and quiet, sedatives (chloral hydrate, chloretone, chloroform anæsthesia), and anti-tetanic serum. Feeding by nasal tube is often necessary; 3 pints of milk and four beaten-up eggs may be given daily.

PART VI.—SURGICAL NURSING.

CHAPTER XXVIII.

THE NATURE AND TREATMENT OF CERTAIN CONDITIONS.

I Inflammation.

When from any cause, such as injury or the action of germs, a part of the body becomes inflamed, various changes successively take place in its tissues, producing *redness, heat, swelling,* and *pain,* with *tenderness* and *impaired function.*

Changes in the Blood-Vessels.—1. The vessels dilate and become more full of blood, this constituting the stage of *congestion,* and causing the redness and heat. The acceleration of the flow does good in that it brings more of the antibodies of the blood to the part.

2. The capillaries become so packed with red and white blood-cells that the current ceases to run. This is the stage of *stasis,* or standstill; it is preparatory to the next stage, for it naturally helps the migration of the leucocytes.

3. The contents of the thin-walled vessels, the leucocytes and serum, escape into the tissues outside. This is the stage of *exudation.* The leucocytes thus migrating attack the bacteria. The escape of serum gives rise to swelling and also causes pain from tension.

Termination.—The inflammatory process, which may thus be regarded as nature's effort in the direction of cure, may terminate in one of the following ways :—

1. All the cells and fluid which have escaped from the blood-vessels may be removed from the tissues by the lymphatic vessels, and the circulation restored so that the part returns to its normal condition (*resolution*).

2. There may be only a partial removal of the products of inflammation. Some remain behind and become converted into fibrous tissue, thus leading to a permanent thickening of the part (*fibrosis*).

3. The inflammatory process may increase in severity until pus is formed by the death of the white cells, which, with portions of the damaged tissues, constitute an abscess (*suppuration*).

4. The part that is inflamed may die from the intensity of the inflammation (*necrosis*).

Treatment of Acute Inflammation—(1) By *Regulated Active Hyperæmia.—Heat* when applied to the skin causes redness, because it dilates the vessels and so increases the quantity of blood in the part. *Cold* produces the opposite effect, causing the skin to become white by contracting the vessels and so diminishing the blood-supply. Both have a soothing influence on the nerves of the inflamed part.

For the purpose of treatment, the process of inflammation may be roughly divided into three stages.

(*a*) In the earliest stage—viz., that of *congestion*—our object is, if possible, to limit the inflammatory process—*i.e.*, to prevent excessive escape of cells and fluid from the blood-vessels. This we are more likely to accomplish by means of cold than heat, owing to the effect which the former has in diminishing the blood-supply of a part. Hence the usefulness of iced compresses and evaporating lotions in the early treatment of a sprain.

(*b*) In the next stage *inflammation has become established.* Our object now is to bring it to an end as quickly as we can, and, if possible, to prevent the onset of suppuration.

This is the stage in which either hot or cold applications may be used. For while the latter diminish the blood-supply, and with it the amount of fluid and cells which are escaping from the vessels, the former, by dilating the vessels, bring more blood, with its leucocytes and antibodies, to the part.

(*c*) In the last stage *suppuration is inevitable,* and here hot moist applications are the only treatment that is admissible; for they relieve pain, hasten the formation of pus, and render its passage to the surface easier.

(2) *By Passive Congestion.*—This method, introduced by Bier, aims at using the passive congestion which results from obstruction of veins in the place of the active hyperæmia which is nature's cure. It is employed especially in suppuration affecting the limbs—*e.g.*, whitlows and inflamed joints; also for tuberculous disease and chronic sinuses.



Bier's Suction Apparatus, with ball.

For the extremities a soft broad rubber bandage is used, bound round the limb on the proximal side of the lesion. It must be sufficiently tight to make the part below bluish-red and swollen, but not cyanotic or anæmic; the pulse of the limb must not be affected. It is well to start with short applications of half an hour; later this period may be extended considerably, even to twenty hours. The affected tissues become flooded with serum, which has a beneficial effect in combating the infection present. In whitlows only small incisions prove necessary under these conditions, and the duration of treatment is thus shortened.

On the trunk and neck, or over sinuses, cupping-glasses or Bier's suction-glasses may be used.

The Reflex Action of Heat and Cold on the Internal Organs.—It is not difficult to understand the effect of hot and cold applications upon *the superficial structures* —*i.e.*, the parts lying immediately beneath the skin. It

is less easy to explain the action of these agents upon *the internal organs*. A fomentation applied to the abdomen will relieve the pain of intestinal colic, while an ice-bag will check diarrhœa, and a linseed poultice on the chest will remove the unpleasant sensation of tightness and stuffiness which is associated with the commencement of acute bronchitis. It is impossible to suppose that the cold of an ice-bag, or the heat of a poultice, extends from the skin through the chest or abdominal wall to the organs beneath. In such cases heat and cold transmit their influence in a roundabout way *by means of the central nervous system*. When, for instance, an ice-bag is placed upon the chest or abdomen, an impulse passes along the nerves running from the skin to the spinal cord. From the spinal cord the impulse returns along the nerves which run to the arteries supplying the organ above which the ice-bag is placed. As a result, those arteries contract, so that a smaller quantity of blood passes through the organ than did before the ice-bag was applied.

II. Septic Infection.

Septic Infection shows itself, firstly, *by local signs* of inflammation, which may go on to suppuration; and, secondly, *by general signs*, due either to the absorption of bacterial poisons from the local lesion (toxæmia), or to an invasion by the bacteria of the lymphatics (lymphangitis) and of the connective tissue spaces (cellulitis) in the region of the wound, or to the passage of large numbers of bacteria into the blood (septicæmia), sometimes with the formation of multiple abscesses in various parts of the body (pyæmia).

1. **Inflammation** has already been dealt with.

2. **Suppuration** results from the killing by the bacteria of the migrated leucocytes and the cells of the part, and the subsequent digestion or liquefaction of these.

An abscess consists of a central collection of the resulting

fluid (pus), surrounded by a wall of living tissues infiltrated with active leucocytes, and that again by living tissues in a state of inflammation. This last zone, at a later stage, consists of *granulation tissue—i.e.*, leucocytes and tissue cells actively proliferating and containing many newly formed blood-vessels.

If drained, the abscess heals by second intention. If unopened, it travels in the direction of least resistance by liquefying the tissues in front of it, until it "points," and bursts through the skin or into a cavity. The signs are those of inflammation, with increased fever and "fluctuation"—*i.e.*, the sensation of fluid between the fingers when gentle pressure is applied by both hands alternately.

3. **Toxæmia** (Septic Intoxication) is the result of pyogenic (pus-forming) micro-organisms multiplying in a wound and using it as a manufactory of toxins, which are absorbed into the blood.

There are three degrees or types—viz. (*a*) *hectic fever*, resulting from chronic sepsis, in which the dose is small but long-continued; the temperature is intermittent, usually 99°-101° F. in the evening, with weakness and emaciation, the illness ultimately ending often in lardaceous disease; (*b*) *septic traumatic fever*, when sepsis follows an operation or injury, and the temperature rises to 102° or 104° F., with the usual symptoms of fever; and (*c*) *sapræmia*, in which the amount of toxin absorbed is large; the onset is accompanied by vomiting and sometimes rigors, with a temperature of about 104° F., and later delirium.

The treatment consists in thorough drainage of the septic part, and the administration of saline infusions under the skin, or into the veins or rectum.

4. **Lymphangitis** is due to the invasion of the lymphatics by streptococci. As a rule it is limited by the nearest lymphatic glands, which may suppurate as a result. It is indicated by diffuse redness, with tender cords of inflamed lymphatic vessels running up towards the glands. The wound is sometimes so minute as to escape observation. It is treated by free incisions into the neighbourhood of

the primary wound, and the administration of antistreptococcal serum.

5. **Cellulitis** is a spreading inflammation of the subcutaneous or intermuscular tissue, due to streptococci. It generally leads to diffuse suppuration, and sometimes sloughing. It gives rise to a boggy, tender, red, œdematous swelling of the tissues with severe throbbing pain, pyrexia, and often rigors. After multiple incisions have been made into the affected tissues, fomentations, hot bottles, or Bier's treatment may be applied.

6. **Septicæmia** is the result of bacteria passing from a wound into the blood-stream and multiplying there. It generally occurs from the infection of small scratches or pricks, and rarely follows the more serious wounds or injuries. It is usually due to streptococci, but sometimes to staphylococci or pneumococci.

The patient has pyrexia with its usual accompaniments; the pulse is quick and the temperature high and remittent; rigors are uncommon; delirium and death often occur. Treatment consists in free drainage of the inflamed part, with intravenous saline infusions several times daily, and the administration of antistreptococcal serum.

7. **Pyæmia** arises from the passage of pyogenic material into the blood, and is associated with severe rigors, an intermittent pyrexia, and, subsequently, multiple abscesses in various parts, and severe depression.

Pyæmia is always preceded by *thrombosis* (clotting of the blood within the vessels) at the site of infection, the *thrombus* (clot) becoming infected by the bacteria present. As a result of the sepsis the clot softens into fluid, and particles of this (*emboli*) are discharged into the circulation, and lodge in distant parts (*embolism*). Each infected particle, or embolus, carries bacteria with it, and thus gives rise to an abscess wherever it may be arrested. If large, the emboli are stopped in the lung. If very small, they pass through the pulmonary capillaries, and lodge in the spleen, kidney, brain, skin, joints, &c. Embolism of the lung gives rise to pleural pain and pneumonia, followed by

abscess or gangrene of the lung; of the kidney, to pain in the loin and hæmaturia; of the spleen, to sudden pain under the left ribs; of the intestines, to blood-stained diarrhœa; of the brain, to hemiplegia; of the joints, to a collection of pus with or without pain; and of a limb, to gangrene or œdema.

Pyæmia is treated by free incision, drainage, or amputation. Antistreptococcal serum and an autogenous vaccine may be tried, and saline infusions and a nourishing diet are also indicated.

III. Necrosis.

Necrosis occurs when an infection causes death of the tissues. It gives rise to an *ulcer* when the loss of tissue occurs on a free surface; to a *slough* when a piece of tissue is killed; and to *gangrene* when part of an organ or a limb dies.

Ulcers may be classified into *traumatic*, resulting from injury or irritation; *septic*, produced by pyogenic cocci; *specific*, caused by tubercle or syphilis; and *malignant*, as in epithelioma and rodent ulcer. Ulcers are most common in the lower third of the leg, where they are often associated with varicose veins. In all, cleanliness, rest, appropriate constitutional treatment, and the removal of every possible source of irritation are required.

Traumatic and Septic Ulcers.—(*a*) While *spreading*, these are painful, the surrounding skin is inflamed, the edge is sharply cut, the surface is covered with lymph and slough, the discharge is thin and abundant, and no granulations are present. They are treated by rest in bed and elevation of the foot, if a lower limb is affected; fomentations or warm antiseptic baths may be applied. The neighbouring skin should be shaved and kept clean. A varicose ulcer, by opening a large vein, may give rise to very serious hæmorrhage, which may be at once stopped by raising the limb and applying pressure to the bleeding spot.

(*b*) When ulcers reach the *chronic*, or "callous," stage, the surrounding skin is congested and œdematous, the edges

are thick and covered with sodden skin, the surface is glazed, and the discharge scanty. They also are treated by assisting the venous return, either by raising the limb or by applying a firm bandage from the toes. If the bandage is used, it should be put on before getting out of bed in the morning and removed after getting into bed at night. Efforts should be made to render the ulcer less septic by boracic fomentations, and the surrounding skin should be kept clean. The ulcer should be protected from injury, and stimulating ointments applied. Glyco-gelatin paste (p. 263) is often useful.

(*c*) In the stage of *healing*, there is no pain and but slight discharge; the surrounding skin is healthy, and white, blue, and red circles of new epithelium can be seen extending on to the ulcer, which is covered with granulations. The limb should be kept raised, and the new epithelium protected by a piece of perforated green protective tissue, cut to the size of the ulcer, covered with wool and a bandage, and changed every four or five days. If the granulations become exuberant, silver-nitrate stick may be applied.

Gangrene is the term used when the necrosis involves either bone and soft parts—*e.g.*, a finger or part of a limb, or a considerable part of an organ. If limited to soft tissues other than the latter, necrosis is usually called *sloughing*. A piece of dead bone is termed a *sequestrum*.

Gangrene may be due to a virulent infection lowering the vitality of the tissues and interfering with the capillary circulation by severe inflammation; to severe injury; or to obstruction of the arteries or veins. When it occurs, there is change of colour with loss of pulsation, of heat, of sensation, and of function—*i.e.*, the signs of local death. Gangrene is *dry*, if due to arrest of the arterial circulation; *moist*, if the venous flow is obstructed but not the arterial.

In *Dry Gangrene* the affected part becomes shrivelled, hard, black, and dry; it spreads slowly, and putrefactive changes are absent.

In *Moist Gangrene* the tissues are at first swollen and

purple ; then blebs appear and the tissues beneath become slimy and soft ; putrefactive changes readily occur, and offensive gases and foul discharge result. Often there is severe constitutional disturbance from absorption.

In both, an inflammatory line develops at the junction of the living with the dead tissues, the "line of demarcation." Ulceration occurs there, and first the skin separates, then the deeper soft parts, and finally the bone.

Treatment consists in (*a*) making the part aseptic—*e.g.*, by shaving, painting with iodine, powdering with boric powder, and wrapping in gauze and wool ; (*b*) raising the limb ; (*c*) keeping the part dry by encouraging evaporation ; (*d*) maintaining the patient's strength ; and (*e*) amputation in moist gangrene, or, in the case of dry gangrene, either amputating or allowing the dead part to separate naturally, according to the site and the general condition of the patient.

IV. Burns and Scalds.

A **burn** results from the application of dry heat or a caustic to the surface of the body, the effect produced varying from mere reddening of the skin to charring and destruction of the whole thickness of a limb. The term **scald** is applied to such injuries as are caused by heated fluids or steam. They are, as a rule, more extensive, and also *more superficial* than those due to a burn, though if the hot fluid is a thick one, such as boiling syrup, which adheres to the skin, the damage sustained by the tissues is frequently very severe.

The gravity of a burn depends on its extent, depth, and situation. An extensive burn on the trunk or head is much more serious than one on the limbs, although the latter may be the deeper of the two. Recovery is rare when as much as one-third of the body surface is involved, even though the skin be only scorched. The resulting shock is necessarily very severe, while the widespread destruction of the cuticle throws more work on the kidneys, and causes

congestion and, in some cases, inflammation of the internal organs.

Burns are frequently divided into **six classes or degrees,** according to the depth to which the tissues have been damaged. These different degrees are naturally often combined in the same burn.

(1) Simple redness, due to scorching of the *surface,* there being no destruction of tissue.

(2) Vesication or blistering, the *cuticle* being detached. Unless the surface affected is very extensive, as may be the case after a scald, healing without scarring soon takes place.

(3) Destruction of the *cuticle and upper part of the true skin.* This is a very painful form of burn, owing to its causing the exposure of the sensitive terminations of the nerves. Healing results in the formation of a thin scar; but, as the whole of the true skin has not been destroyed, there is no deformity or contraction.

(4) Destruction of the *whole of the skin.* Here we have the characteristic parchment slough, which only separates after prolonged suppuration. The nerve-endings being destroyed, the pain is less than that which is caused by a burn of the third degree. Owing to the complete destruction of the skin, a fibrous scar is formed, which tends to contract and results frequently in a disfiguring and, sometimes, a disabling deformity.

(5) The *deep fasciæ* and, sometimes, the *muscles* are involved, with marked scarring and deformity as a result.

(6) The *whole limb* is charred.

Symptoms.—The constitutional effects of a burn depend upon its situation, the extent of body surface involved, and the age of the patient. Of less importance is the depth to which the tissues have been burnt. As would be expected, burns are most fatal in children and old people.

After a severe burn there is a *stage of prostration or shock,* which lasts for about twenty-four hours, due in part to the sudden and intense terror which the patient has endured.

In children this condition of shock is very severe, and death not infrequently results from it. The patient is pale and shivering, with a low temperature, and feeble fluttering pulse. Among the most prominent symptoms at this period are pain and thirst.

At the end of twenty-four to forty-eight hours *reaction* sets in, the temperature rises, and the pulse becomes stronger. There is now a *period of inflammation*, the duration and severity of which depend largely upon the depth of the burn, and the consequent size of the slough which must separate before healing can commence. In extensive burns of the fourth degree there may be prolonged suppuration before the whole of the dead tissue comes away. During this time poisonous products are passing from the wound into the system, leading to fever and constitutional disturbance, which may be so severe as to cause the death of the patient. In some cases serious hæmorrhage occurs during the separation of large and deep sloughs.

Nursing and Treatment—

1. **Local.**—The utmost gentleness must be used in *removing a patient's clothes.* This is especially necessary when the cuticle is raised by blisters, as any careless tearing away of partially detached pieces of skin will add to the pain and intensify shock. For this reason the clothes, or what remains of them, should always be cut off if there seems likely to be the least difficulty in removing them, while any foreign matter that may be adhering to the wound should be washed away by gently syringing. Immersion in a warm bath (95° F.) is a very useful method of treating scalds and extensive superficial burns of the trunk in children, as the clothing which adheres to the injured surface is thus soaked off. The child should be gradually removed from the bath, strips of dressing being applied as successive portions of the lesion come into view.

It is important *to exclude air*, by applying dressings as quickly as possible to the burn. On this account the whole of a large wound caused by a burn should not be exposed at once, but the dressing should be applied in strips which

can be separately removed and renewed. Burns should not be dressed more often than is necessary. If the dressings tend to adhere to the burnt surface, they should be removed by the aid of warm boric lotion.

In burns of the first degree, where the surface is merely reddened by scorching, the smarting pain is most quickly relieved by the use of cold wet applications, the inflamed area being afterwards thickly dusted with flour and wrapped in cotton-wool.

In burns of the second degree blisters should be pricked, or gently snipped with scissors at their most dependent points, to let out the serum; but no attempt should be made to remove the skin. As the cuticle will in places have come away, leaving a raw surface, neither flour nor wool should be applied directly to the burnt area, otherwise it will stick to it. Oily dressings should be used, such as strips of lint soaked in carron-oil (made by mixing together equal parts of linseed-oil and lime-water) or smeared with vaseline. Gauze soaked in a solution of picric acid (picric acid 1½ dr., absolute alcohol 3 oz., water to 2 pints) is also much used in the treatment of burns and scalds. This is covered with aseptic gauze, and over all a layer of wool is bandaged. The surrounding skin should be well cleaned.

In burns of the third and fourth degrees carron-oil or vaseline may be applied for the first forty-eight hours, and afterwards hot moist antiseptic dressings to hasten the separation of the sloughs. Profuse suppuration, following upon a deep burn on one of the extremities, is sometimes treated by prolonged immersion of the part in a limb bath containing a warm, weak, antiseptic solution.

In the stage of repair the burn may be dusted with an aseptic powder and exposed to the air until it heals under the scab that forms, or a dressing kept moist with Dakin's solution may be used. Paraffin preparations, such as "Ambrine" or "No. 7 paraffin," are sometimes used. The raw surface is cleaned with saline solution, dried with gauze, and sprayed with the melted paraffin; a thin layer

of cotton-wool, cut to size, is placed over this, and more paraffin applied. The waxy dressing thus formed is peeled off every morning, and another applied until the wound is healed. By this method the scarring is generally less.

In severe burns the nurse must carry out all instructions with regard to the moving of joints and careful fixing of splints and extensions, so as to prevent as far as possible the contraction of the cicatrix. Skin-grafting is used to hasten the healing of extensive burns, and so diminish contraction.

2. **Constitutional Treatment.**—During the *stage of shock*, hot bottles, warm blankets, and stimulants are necessary; but the latter should be used with caution, or the resulting reaction may be too severe. Opium will probably be ordered to relieve pain and quiet the patient, while as soon as possible he should be given some fluid food.

When reaction sets in we must endeavour to keep up the patient's strength, to prepare him for the period of suppuration which will follow if the burn is a deep one. The diet must be nourishing but light in character, and administered with discrimination. For it must be remembered that during this period, if the burn is extensive, the internal organs, and among them the stomach, will be in a state of congestion, and therefore unable to do their usual amount of work.

V. Wounds.

Open Wounds may be: (*a*) *Incised—i.e.*, made with a sharp cutting instrument, and therefore presenting clean-cut edges; (*b*) *Lacerated*, in which case the edges are ragged; (*c*) *Contused*, where there is bruising of the edges; (*d*) *Punctured*, in which the external opening is small as compared with the depth of the wound.

Incised wounds are liable to bleed freely, but, other things being equal, heal rapidly. Lacerated and contused wounds, on the other hand, bleed less and heal more slowly.

Punctured wounds, owing to the small external opening, are difficult to drain and hence liable to become inflamed.

Healing of Wounds.—This takes place in one of two ways :—

1. *Without Inflammation—i.e.*, without more than the temporary inflammation caused by the infliction of the wound. The edges straightway become glued together, and remain so. There is at no time any discharge beyond a small quantity of blood-stained serum in the first few hours. At the end of ten days or a fortnight the wound has completely healed, a thin red scar being all that remains of it. This is called *primary union*, or *union by first intention*. This is the way in which incised wounds usually heal, and such punctured wounds as have been made by a clean cutting instrument, and contain no foreign matter in their depths—in other words, wounds that are aseptic.

2. *With Inflammation.*—Some source of irritation is present in the wound, which prevents the sides of it becoming glued together and healing by primary union. As a result of this, the inflammation, which in a clean-cut wound does no more than glue the edges together, persists, and leads to the formation of pus.

This irritation may be due to the nature of the injury—*e.g.*, if the edges of the wound are bruised or lacerated, they must die and be separated from the adjacent healthy tissues before healing can take place. Or it may be caused by the presence of a foreign body or germs in the wound, want of proper drainage, or lack of vitality in the patient. Owing to one of these causes persistent inflammation is set up in the wound, leading to the formation of pus, and consequent slow process of *healing by granulation—union by second intention*, as it is called.

In such a case, about the third or fourth day after the injury small red elevations are seen at the bottom of the wound. These are called "granulations" or "granulation tissue." Day by day this tissue grows upwards from the bottom of the wound. It is so delicate and easily irritated that even the dressings which rest on it cause the cells

which line its surface to perish and separate from it. When the granulation tissue has filled the wound and risen on each side to the level of the skin, the latter begins to grow over it, until at last the whole of the wound is covered with skin, and healing is complete.

The scar formed when healing takes place by this method is very different from that which follows " primary union." In that case, owing to the sides of the wound at once growing together, practically no new tissue is formed, so that scarring is reduced to a minimum. When much granulation tissue is formed, a well-marked scar is the necessary result, since all the new tissue eventually develops into fibrous or *scar tissue.* This, as it forms, very slowly contracts, so that if the original injury, such as a deep burn, caused much loss of tissue, the ultimate deformity from contraction of the scar may be very great.

Treatment.—The treatment will depend on whether the wound is recent or not, and, if recent, whether it is clean or soiled.

1. **Clean Wounds.**—Any hæmorrhage is first arrested. The surrounding skin is shaved, rubbed with soap-and-water, and with alcohol and ether to remove the fat, and finally treated with antiseptic solution. The wound is cleansed of foreign particles by irrigation with saline solution, and, after it has been ascertained that there is no foreign body present, and no nerve or tendon injured, the edges are sutured, a dressing applied, and the part immobilised by splint or bandaging.

2. **Soiled Recent Wounds** are often partially devitalised by contusion, and are therefore liable to become septic unless thoroughly treated in the early stage. After the skin has been treated as above described, the wound is laid open and all the devitalised tissues excised and removed, with any dirt, foreign bodies, and blood clot. The wound may then be washed out with an antiseptic, such as Flavine 1 in 1000, or Dakin's solution; or " Bipp," a paste of bismuth, iodoform, and liquid paraffin, may be rubbed into it. In applying Bipp, the skin and wound

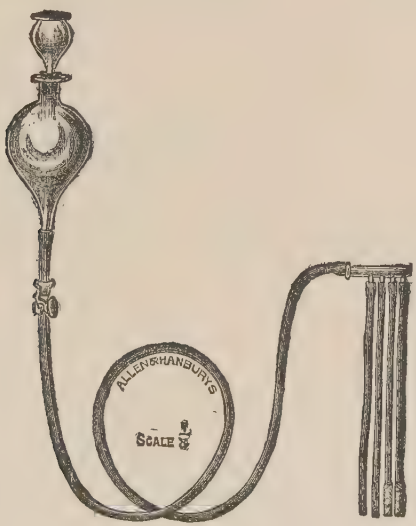
cavity are swabbed over with methylated spirit and dried; the paste is then rubbed into every crevice with a piece of gauze so as to leave only a very thin layer, any excess being removed. If it is certain that all parts have been thoroughly cleaned, the wound is then sutured without drainage.

If, however, it is doubtful whether asepsis has been attained, or if the deep or superficial parts of the wound cannot be effectually brought together, it is well to use drainage for a short time only—*e.g.*, a piece of rubber tubing, soft folded rubber, a few strands of silkworm gut, or lightly packed ribbon gauze.

3. **Septic Wounds** are those in which there is inflammation due to pus-forming organisms. There are the usual local signs of inflammation, and often the general symptoms of pyrexia. Bacteria are multiplying deep in the damaged walls, and it is necessary to attack them there. The older antiseptics could not be used effectually against them, because prolonged irrigation with them in a sufficient strength both injured the tissue cells and destroyed the natural defences of the body. In recent years, however, it has been found that a solution of hypochlorite of soda, while a moderately powerful antiseptic, is practically non-irritating to the cells, and possesses the additional advantage of being able to dissolve any dead tissue present. In the form of Dakin's solution it is used in the Carrel treatment of septic wounds, which aims at applying the antiseptic to the whole surface of the wound for a sufficiently long period to render the discharge practically sterile, and to allow of the closing of the wound by sutures.

The Carrel apparatus consists of a reservoir, containing an antiseptic, placed 2 or 3 ft. above the patient, and connected by rubber tubing to a glass distributing tube; to the several nozzles of this are attached narrow rubber tubes, each of which has fine perforations near the distal end which is closed. These perforated tubes are placed in the wound, and are kept in position by gauze soaked in antiseptic, and covered by a Carrel pad (made of an inner layer of

absorbent and an outer layer of non-absorbent wool). By means of a pinchcock on the tubing near the reservoir, the antiseptic may be allowed to flow for a few seconds every one or two hours, being regulated so that the wound is thoroughly moistened without the patient being made wet. To prevent the skin becoming sore, it should be covered in the neighbourhood of the wound with thin pads of butter muslin soaked in sterilised vaseline. The dress-



Carrel's Apparatus.

ing is changed once a day. Care should be taken that the tubes and dressings are treated aseptically. The discharge is examined bacteriologically, and when it becomes practically sterile, the wound is closed by "secondary" suture.

4. **Granulating Surface Wounds.**—Dry gauze adheres, and so causes pain and damage to the granulations. If the wound is clean, weak boric or eucalyptus ointment may be used. A thin layer of perforated celluloid, over which is placed a saline gauze compress covered with oiled

silk, is an excellent mode of treatment, especially if saline irrigation is used twice daily. Scarlet-red ointment is sometimes employed to stimulate the growth of epithelium, the surrounding skin being smeared with weak boric ointment. Exuberant granulations may be reduced by the application of a silver-nitrate stick.

Skin-grafting is sometimes required to enable extensive wounds to heal. There are three methods :—

(*a*) *Reverdin's*, in which tiny cones of the skin of the thigh are picked up on the point of a needle, cut off with a sharp scalpel, and placed at intervals on the granulations, which should have been thoroughly irrigated with normal saline. The skin should previously have been washed with soap-and-water, followed by alcohol only. The dressing should consist of a piece of thin perforated celluloid, kept in position by strapping, and covered with a saline gauze compress and protective. Saline irrigations may be used twice daily, but the celluloid should not be removed for eight days.

(*b*) *Thiersch's*, in which large and very thin grafts are cut with a razor from the thigh, and used to cover the granulations.

(*c*) *Tubular grafts* are made by selecting a region which can be approximated to the part to be grafted, raising a sufficiency of skin with the subcutaneous fat from the deeper tissues and making it tubular by sutures, but leaving the ends uncut. After a few days one end is divided, and the tube is opened and laid on the surface to be grafted. After an interval to allow of the circulation in the graft to develop, the other end is divided. These grafts are superior in appearance and strength.

Dressing a Wound.—This should be done with strict aseptic precautions. All articles required should be got ready first—viz., dressings, kidney-tray, sterilised dressing forceps, dissecting forceps, probe, and scissors. A non-aseptic nurse (see p. 515) having removed the bandages and outer dressings, the aseptic nurse arranges the sterile towels around the wound, and removes the remain-

ing dressings with forceps. If directed to do so, she removes the stitches by seizing the knot with the dissecting forceps, drawing it to one side, and cutting through the stitch with fine-pointed scissors, taking care not to make the wound gape. If a drainage-tube is to be changed, a sterile duplicate one should be prepared, in order to avoid the delay entailed in cleaning and sterilising the one removed. The wound is painted with tincture of iodine, and a fresh dressing of gauze and wool bandaged on. Patients with clean wounds should be dressed before those with infected ones.

VI. Hæmorrhage.

Arterial Hæmorrhage is bright-red, and issues in spurts from the cut end nearest the heart. *Venous* hæmorrhage is dark bluish-red, and flows steadily from the cut end farthest from the heart. *Capillary* bleeding is red, and the oozing takes place from all parts of the wound.

Arterial Bleeding may be primary, reactionary, or secondary.

(*a*) *Primary Hæmorrhage* is that which occurs at the time of the operation or injury.

(*b*) *Reactionary Hæmorrhage* is that which occurs within twenty-four hours after operation. As the patient gets warm in bed and the shock of the operation passes off, the strength of the circulation is improved, and, as a result, small vessels may bleed which did not show themselves when the patient was on the operating-table. It is not a common occurrence, and, unless it is due to the slipping of a ligature, is usually a little oozing.

If *internal hæmorrhage* is suspected, the surgeon should be at once sent for, and the patient kept as quiet as possible. If he is faint the foot of the bed should be raised, heat applied, and hot drinks given. As it is of the greatest importance that hæmorrhage should be distinguished from shock, it will be well to indicate clearly the points of con-

trast. In *hæmorrhage* the onset is after an interval; the patient, who is mentally active, feels suffocated and is restless from air hunger. There is often local tenderness and pain; the pulse-artery is flabby, respirations are sighing, and there are recurrent attacks of faintness from deficient supply of blood to the brain. *Shock*, on the other hand, is immediate; the patient is lethargic; there is no pain; the pulse-artery is distinct; respirations are shallow and quiet; and there are no attacks of faintness.

(*c*) *Secondary Hæmorrhage*, which occurs later, is of serious import. It is usually due to a septic condition of the wound, and was frequently seen before the days of antiseptic surgery. Though now comparatively rare, it is a possibility which must never be forgotten by the nurse. It should especially be noted that small recurrent hæmorrhages may prove to forerun a profuse one.

The Natural Arrest of Hæmorrhage is brought about partly by the cut inner and middle coats of the vessel retracting within the outer fibrous coat, and partly by the blood coagulating in and about the cut vessel. Eventually the blood clot and the tissue cells organise into fibrous tissue, and thus the vessel is obliterated.

Treatment.—(1) *Arterial Hæmorrhage.*—Any bleeding, however slight, should be at once reported to the surgeon, and if there is only slight oozing, the nurse may safely wait. Should the hæmorrhage, however, be profuse, prompt action will be necessary. Unless the surgeon has left a tourniquet in position (a Samway's or anchor tourniquet is commonly used), with instructions to her to use it, she should try to stop the bleeding by applying pressure. If she is not able to exert direct pressure on the bleeding point, she must prevent blood reaching the wound from the heart by compressing the artery between the two.

In the lower limb *the femoral artery* can be forced against the brim of the pelvis by pressing firmly with both thumbs in a backward and slightly upward direction in the centre of the groin—*i.e.*, at a point midway between the anterior

superior spine of the ilium and the centre of the symphysis pubis. Owing to the thickness of the muscles, it would be difficult for a nurse successfully to compress the vessel below this point.

In *the upper extremity* hæmorrhage can be easily arrested by pressing the artery against the inner aspect of the humerus in the centre and upper part of the arm.

Hæmorrhage from a branch of the *common carotid artery*



Compression of Right Femoral Artery.

may be controlled by placing the thumb beside the larynx, and exerting firm pressure in a backward direction against the vertebral column.

Hæmorrhage *from the tongue* after the removal of the whole or a portion of that organ is controlled by keeping the mouth open with a gag, placing the first two fingers on the stump of the tongue and pressing it downwards and forwards.

Reactional and secondary hæmorrhage usually require a

reopening of the wound under an anæsthetic, in order that the bleeding vessel may be ligatured.

(2) *Venous Hæmorrhage* is not uncommon in connection with varicose veins of the leg. The patient should at once be placed in the recumbent position, and the limb raised; garters should be removed, and pressure applied by the finger to the bleeding spot. A tourniquet, of course, should never be used. Later, a pad and bandage should be applied.

(3) *Capillary Hæmorrhage* is usually readily arrested by



Compression of Right Brachial Artery.

the firm application of a gauze pad and bandage. If necessary, adrenalin or turpentine may be used locally.

Bleeding from Defective Clotting.—In *hæmophilia*, *jaundice*, and *leukæmia*, there is some defect in the chemical composition of the blood which renders it deficient in clotting capacity. Free capillary oozing occurs even from quite insignificant wounds, and in this way large quantities of blood may be lost. The wound requires to be packed with gauze, soaked in adrenalin and firmly bandaged on, and calcium chloride may be given internally.

Hæmophilia is hereditary, usually affecting the male

only, but being transmitted by the female. Its subjects are known as "bleeders," and operations, unless absolutely necessary, should not be performed on them.

VII. Shock and Syncope.

Shock is a depressed activity of the functions of the body, which may occur after serious injury, and which is due to a temporary diminution in the volume of blood circulating. Sometimes the patient dies before the volume can return to normal. Shock is especially liable to occur when the patient is emotional and timorous, when nerves or large masses of muscle are injured; and when the operation is prolonged, much blood is lost, and the patient gets cold from exposure.

Symptoms.—The pulse is frequent, soft, and weak; the temperature is subnormal, and the respirations shallow and irregular; the skin is pale, cold, and sweating, and the patient lethargic, with pinched face and sunken eyes.

Treatment consists in rest, moderate warmth, and hot fluids by mouth. Pituitary extract may be injected into the muscles or into a vein. In severe cases the foot of the bed should be raised and saline solution injected. Intravenous injections of Bayliss's gum solution (60 grammes gum acacia and 9 grammes sodium chloride, dissolved in 1 litre water in a water-bath, and strained) are more lasting in their effects. Blood transfusion is sometimes useful.

Syncope is a sudden fall in the blood-pressure resulting from a temporary anæmia of the vital centres in the medulla. It may be due to emotional influence, or to the reflex action of pain on the nerve centres, as when the sphincter ani is stretched before a patient is fully anæsthetised.

The symptoms resemble those of shock, but are more sudden in their onset, and pass off more quickly. The head should be lowered, and stimulants given—*e.g.*, alcohol by mouth; sal volatile as an inhalation; strychnine, alcohol, or camphor hypodermically. In severe cases 5 minims of

adrenalin chloride (1 in 1000) are sometimes given intravenously.

VIII. New Growths.

In a large majority of cases a new growth gives rise to some form of swelling or tumour; in others it presents itself as an ulcer in which there is new growth but very little swelling, certainly nothing that can be called a tumour. On the other hand, there are tumours which are not new growths; they are tumours only in the sense that they are swellings. A violent blow on the head will produce such a tumour from effusion of blood beneath the scalp, while a localised swelling is often caused by inflammation. New growths are divided into two classes, innocent and malignant.

An Innocent Growth is one which grows among the tissues and may push them aside as it increases in size, but it does not invade them and destroy their structure, nor is it a danger to life unless it mechanically interferes with some vital organ. A *lipoma*, or fat tumour, is an excellent example of an innocent growth. It may attain to a great size, but it does not give rise to similar tumours in other organs, and, if it is completely removed, it never recurs.

Other innocent growths are: *fibroma* (fibrous tissue), *myxoma* (mucous tissue), *chondroma* (cartilage), *myoma* (muscle), *neuroma* (nerve), *angioma* and *nævus* (blood-vessels), *odontoma* (teeth), *adenoma* (gland tissue), and *papilloma* (epithelium).

A Malignant Growth, on the other hand, is, as its name indicates, a menace to life wherever it occurs, for it not only grows among but also into surrounding structures, thus gradually destroying them; it tends to reproduce itself in other parts of the body by means of "secondary" growths; and, unless it is removed in a thorough manner as soon as it is discovered, there is a grave risk of its recurrence. There are, as one would expect, varying degrees of malignancy among such growths. Some increase rapidly in size, almost invariably recur after removal, and

with equal certainty reproduce themselves in the internal organs. Others grow so slowly that their presence excites no alarm, and early removal is almost always followed by a cure. The malignant growths, or cancers, are divided into two classes, the sarcomata and the carcinomata.

Sarcoma is composed of cells of connective tissue, and occurs mostly in children and young adults. As a rule this form of cancer grows quickly, and, unless it is removed in good time, some of its cells are carried by the blood-stream to other parts of the body, where they lodge and in a very short time reproduce the parent tumour. Thus, a sarcoma of the humerus may give rise to secondary growths in the liver or lungs. A tumour which grows rapidly and at an early stage infects the system through the blood-stream possesses a high degree of malignancy, and is therefore, if possible, removed as soon as its presence is recognised.

Carcinoma, or cancer proper, is composed of epithelial cells, and occurs in older subjects and is a slower grower. It not only gives rise to growths in distant organs through particles which are carried by the blood-stream, but also spreads locally along the lymphatic channels by means of delicate columns of cells which are quite invisible to the naked eye, but obvious under the microscope, which will certainly cause a local recurrence of the cancer if they are left behind when the growth is removed. It is for this reason that such very extensive operations are performed nowadays when an organ like the female breast, which has abundant lymphatic connections, becomes the seat of cancer. Not only is the breast itself removed with the underlying muscles, but the glands, lymphatic vessels, and fat are carefully dissected out of the axilla, even when there is no obvious disease in that part. By such radical methods alone can one hope to extirpate the outposts of the cancer, and minimise the chance of a local recurrence.

Rodent Ulcer is a cancer of the sebaceous glands; it is very slow in its advance, and is often cured.

Treatment of New Growths.—An innocent growth

is removed if it causes pain, inconvenience, or mental worry, or if there is considered to be any risk of its changing in character and becoming malignant. As an innocent growth does not invade or infiltrate the surrounding tissues, but is shut off from them by a capsule, it is only necessary to remove the tumour itself without disturbing the neighbouring structures.

A **malignant** growth is removed, if possible, as soon as its character is determined. Unfortunately, these growths not infrequently appear in situations which render any attempt at extirpation out of the question, while it is obviously hopeless to operate on a primary growth which has already given rise to secondary growths in one or more of the internal organs. The reason why a much more extensive operation is necessary in the case of malignant growths than is required for innocent tumours has already been explained. During the last few years many cases of *inoperable cancer*, where the growth cannot be removed by reason of its extent or position, have been treated by the application of radium and the X-rays. In a certain number there has been a considerable temporary improvement, and in a very few an apparent cure, the growth completely disappearing under treatment. Another remedy that has been used in these hopeless cases is Coley's fluid. It had been noticed that malignant tumours occasionally disappeared after an attack of erysipelas. It is endeavoured to produce the same effect by the injection of Coley's fluid, which consists of a mixture of the toxins of the erysipelas coccus and those of another germ. It is very powerful, and has at first to be given in extremely minute doses. Cases have been recorded in which it appears to have produced a cure.

CHAPTER XXIX.

THE PRODUCTION OF SURGICAL CLEANLINESS.

The Progress of Surgery.—Seventy years ago surgeons knew nothing of the influence of germs upon the healing of wounds. Suppuration after operation was then the rule rather than the exception, the death-rate in consequence being enormously high; indeed, many surgeons refused to undertake operations which are now performed with impunity.

Then came M. Pasteur with his wonderful researches into the processes of fermentation and putrefaction, both of which he proved conclusively to be the work of germs. From the knowledge so gained Lemaire argued that suppuration occurring in a wound was due to the same cause, and instead of being essential to the process of healing, as had hitherto been taught, was inimical to that process, and should, if possible, be stopped. This, he showed, might be done by means of antiseptics, which would either kill the germs or at least prevent them growing.

To Lord Lister belongs the credit of grasping the enormous importance of Pasteur's and Lemaire's discoveries in the practice of surgery. He went a step further, and devised a method whereby living germs might be prevented entering an operation wound, and causing it to become septic.

Antiseptic Surgery.—Lister's method was called the "antiseptic" method, and consisted in the constant use of antiseptics, or, as they are more properly called, germicides, so that all germs in the neighbourhood of the wound might

be killed. With this end in view, a spray of carbolic acid and water played on the wound during the time it was exposed to the air. It was flushed with a strong germicidal solution before the stitches were put in, and dressings impregnated with some antiseptic were afterwards applied. The sponges, instruments, and hands of those who assisted at the operation were treated with similar solutions.

These precautions were essentially "antiseptic"—that is to say, they were undertaken with a view to preventing the development of any septic germ which might happen to gain entrance to the wound, for the original idea was that microbes, being everywhere present, must gain access to the wound, and consequently such solutions must be used as would kill them or hinder their development.

Aseptic Surgery.—At the present day our object is still to keep the wound free from germs; but it is now recognised that the principal danger lies in its direct contamination during the operation. Our efforts, therefore, are now directed towards ensuring a complete freedom from living germs of everything which may be used during an operation. By doing this, we prevent germs entering the wound, and render it unnecessary to apply to the tissues chemical antiseptics, which are often irritating in their effect. At the same time, we have by no means given up the use of these drugs, for in the preparation of the hands, and of the patient's skin, and in the process of preparing certain ligatures, they are indispensable, as will be seen later, to the production of a state of surgical cleanliness (*asepsis*).

The Production of Asepsis.—By "asepsis" is meant the absence of septic germs. It is of the utmost importance that a nurse should understand how to make aseptic everything which is concerned in the treatment of an operation wound. Owing to the universal prevalence of germs, it is by no means an easy matter to protect the patient from them. This can only be done by the most careful, intelligent, and unremitting attention to minute details of *cleanliness*, assisted by, firstly, *sterilisation* by heat (either steam or boiling water), and, secondly, the

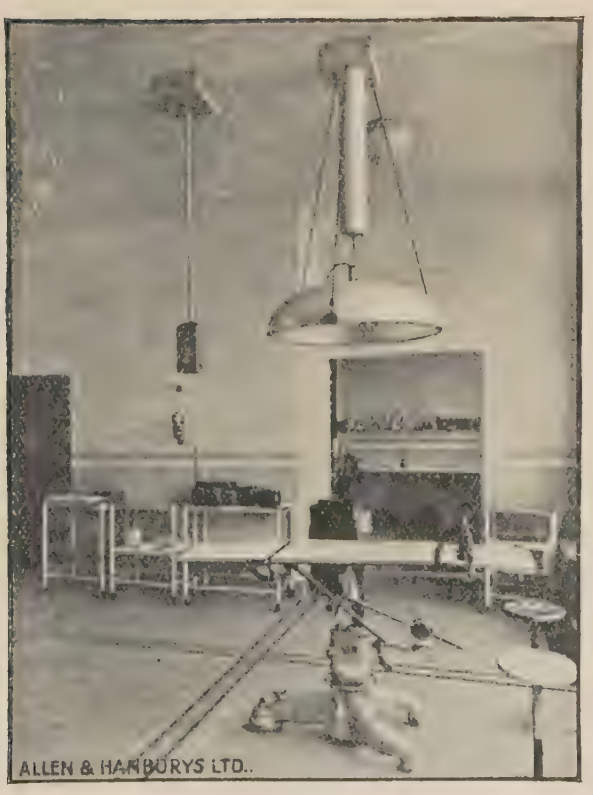
judicious use of *antiseptics*. The non-success of many an operation has been due to some slight carelessness on the part of a nurse who has failed to recognise the importance of little things. Want of attention at any point may admit of the entrance of germs, and lead to suppuration of the wound. The great truth that a nurse must always keep before her is, that for the production of asepsis cleanliness is all-important, and that antiseptics play but a very secondary part. She must never delude herself with the idea that a dip into 1 in 20 carbolic acid will make up for want of thoroughness in cleaning. Such a delusion, which even now is only too common, is fraught with danger to the patient.

Everything likely to come within the field of an operation will now be described, and the best way pointed out to render each as nearly as possible aseptic.

1. **The Operator, Assistants, and Nurses.**—(*a*) *Preparation of the Hands.*—Although absolute sterilisation of the hands cannot be obtained, yet it is possible to arrive at such a degree of disinfection as practically to avoid the risk of their conveying septic infection to the wound. If the nails are cut sufficiently short, scrubbing with a nail-brush (sterilised in the steam steriliser, or by boiling in soda solution, and kept for use in lysol, 1 in 50, or biniodide of mercury, 1 in 1000) will generally clean the nails without the aid of a nail-cleaner. After the hands and forearms have been thoroughly soaped, brushed, and dried, methylated spirit should be rubbed over the parts with a piece of gauze, working well round the nails, and taking at least two minutes over the process. Some surgeons are content with this, others prefer that a solution of biniodide in spirit (1-500) should then be similarly rubbed in and the hands finally rinsed in normal saline solution or sterile water. When the "aseptic" nurse has cleaned her hands in this way, she should be very careful to touch nothing that is not sterile until the operation is completed, otherwise germs will certainly adhere to her hands and then she will have to go through the whole cleaning process again.

(*b*) *The Use of Gloves.*—As an additional precaution it is usual for the surgeon, his assistant, and those of the nurses who handle sterilised articles, to wear rubber gloves. It is important that the hands should be thoroughly disinfected before the gloves are put on, as there is always danger of the latter being torn or punctured, and there is generally a certain amount of fluid in the interior which may escape. Gloves may be put on either wet or dry. In the *wet* method the gloves are sterilised by boiling for a quarter of an hour in plain water and placed in a bowl of normal saline solution. The hands are more readily introduced if they have been smeared with equal parts of glycerine and methylated spirit, or the gloves may be distended with saline solution. As frequent boiling rots them, they should be sterilised only before use. In the *dry* method, which is preferable, the gloves, wrapped in a layer of gauze, are placed in a calico bag with a piece of gauze which is to be used for drying the hands and a small bag containing talc powder. Together they are sterilised for about twenty minutes in the steam steriliser. When the hands have been dried with the gauze and well dusted with the sterile talc powder, the gloves can be readily drawn on. After use they should be thoroughly washed on both sides and distended with water *to see that there is no puncture ;* they should then be hung up to drain, dried on both sides, lightly powdered on both sides also with talc, and, with the roughened surface outside, wrapped in gauze ready for sterilising. To turn a glove, first turn the upper portion and allow it to distend itself with air ; the fingers can then be readily inflated, and so turned, by pinching the wrist part and squeezing downwards.

(*c*) *Operating Costume.*—All persons in the theatre should wear sterilised gowns and caps ; the nurse should see that her hair is *completely* concealed by a triangular bandage. Masks are worn by those in close proximity to the operation to prevent infection from the mouth by particles of saliva. Rubber over-shoes, which have been washed with carbolic lotion, may be drawn over the boots ; or



Operation Theatre, with Skialytic (shadowless) Lamp.

washable linen bags, pinned or tied above round the calf, may be used for this purpose.

2. **The Operating Theatre.**—(*a*) *The Theatre* should be—

(i) *Clean and free from dust.*—Where there is dust there are germs. The less dust there is moving about in the air at the time of operation, the fewer germs there will be to settle on the wound. No dusting or brushing should therefore be done in a room for at least four hours before the operation is performed, so that the germs in it may have plenty of time to settle again on the walls and floor. Such dusting as is necessary should be done with a damp cloth. Modern theatres are built with glazed or enamelled walls and mosaic flooring, and are therefore easily kept clean by flushing with a hose.

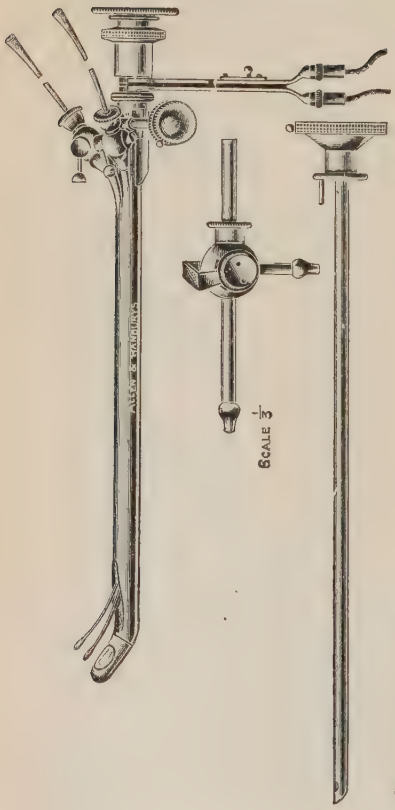
(ii) *Of a proper temperature.*—It is very essential that the room should be warm enough, otherwise the patient will be more likely to suffer from shock after the operation. The nurse should therefore be thoroughly acquainted with the method of warming the theatre, and be able to regulate it accurately. A good average temperature is 65° F., and in severe abdominal operations it may with advantage be raised somewhat higher; but the surgeon's wishes in this respect should always be consulted, as some operators prefer a higher temperature than others. The theatre should be well ventilated and free from excess of moisture.

(*b*) *The Tables.*—An operating-table is made of metal, either brass, nickelled copper, phosphor-bronze steel, or enamelled iron, and it is generally so constructed that the various positions necessary for particular operations can be readily obtained. Among these may be mentioned the *Trendelenburg position*, in which the body is tilted until the pelvis is considerably higher than the chest; this is helpful in operations on the pelvic organs, in that it causes the intestines to sink away towards the diaphragm, leaving the pelvis empty of movable viscera. There is usually provided some means for heating the table, either by hot water or electricity. It should be kept polished and be

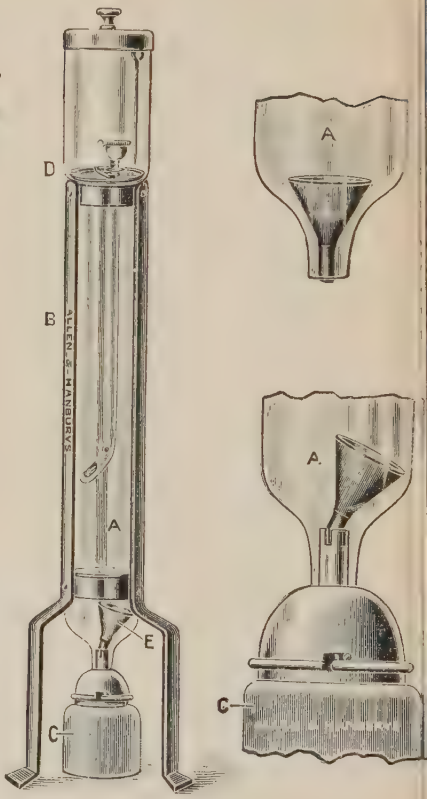
thoroughly cleaned with soap and water after operations, and wiped with a cloth moistened with a disinfectant before use. The smaller tables for instruments, ligatures, drums, and lotion-bowls, and the one for the anæsthetist's use, should be cleaned thoroughly in the same way. When not in use they should be kept covered with sterile sheets.

3. **Instruments.**—Instruments can be rendered absolutely sterile by means of boiling water. A piece of lint is placed over the bottom of the wire tray of the steriliser, as spotting of the instruments is produced if they rest on the metal, owing to galvanic action being set up. A teaspoonful of washing-soda having been added to each pint, the water is brought to the boiling-point. When the soda solution has been boiling for a few minutes, and not before, the tray containing the non-cutting instruments is immersed, and the water kept on the boil for at least five minutes. The instruments are now sterile, and should be removed with sterilised forceps from the soda solution or the wire tray, and placed in a sterile dish containing either plain sterile water, a weak antiseptic solution, or a dry sterilised towel. *Aluminium instruments* should be boiled in plain water, not in soda solution. *Knives* should not be boiled for more than two minutes, as this process quickly dulls their edges; indeed some surgeons prefer to rely only on immersion in methylated spirit or a 10 per cent solution of lysol for an hour, or in undiluted lysol for two minutes. *Needles* should be stuck into a piece of lint for sterilising. *Special instruments*, such as cystoscopes, certain catheters, &c., which cannot be boiled, must be rendered surgically clean by some antiseptic solution.

The object of boiling the water before placing steel and plated instruments in it is to expel any air that it may contain, as there is then less likelihood of their becoming rusty. This is further prevented by the addition of the soda. Soda solution is necessary only for steel and plated articles. Aluminium instruments and silkworm-gut, and to a less extent other ligature materials, are damaged by soda and should be boiled in plain water. Two sterilisers



Cystoscope for Catheterisation of both Ureters.



"Autan" Catheter and Cystoscope Steriliser.

(Formaldehyde gas is generated by placing a vial of "Autan" powder in the glass chamber C and adding water.)

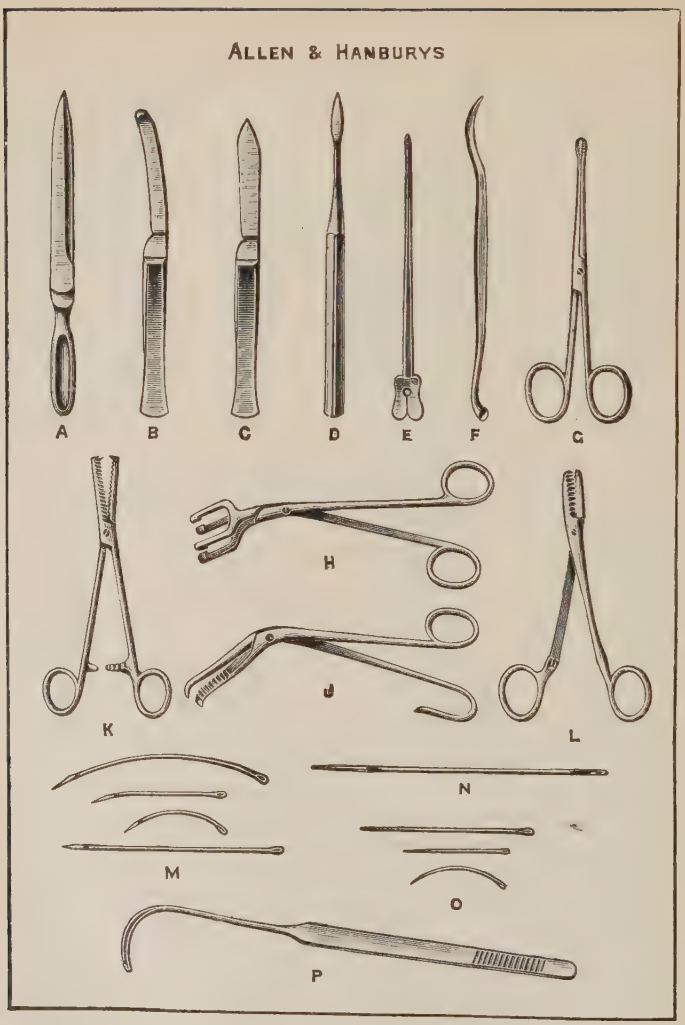
may be used, or, if only one is available, ligatures and drainage-tubes may be sterilised first in plain water and removed; the soda can then be added and the steel instruments boiled.

After an operation or dressing the instruments must be thoroughly scrubbed with a clean nail-brush and soft soap and water, particular attention being paid to the grooves and joints in such instruments as artery forceps and clamps, and subsequently boiled for five minutes in the solution of washing-soda. They are then rinsed in water to remove the soda, placed in methylated spirit to remove the water, and then dried.

Certain instruments are needed at nearly all surgical operations—viz., dissecting forceps, knives, artery forceps, scissors, probe, director, blunt dissector, sinus forceps, towel-holding forceps, retractors, aneurism needle, suture needles, and needle-holder.

Knives may have short broad blades with sharp points (scalpels), or longer blades narrow in proportion to their length (bistouries); the latter may be sharp-pointed or probe-pointed, and straight or curved. The hernia knife, which apart from the handle is about four inches long, has a cutting edge of about an inch a short distance from the end; it is used to divide the constricting band in cases of strangulated hernia. Other special knives are the Liston amputation knife, and sharp- and blunt-pointed tenotomy knives for dividing tendons and fascia subcutaneously. *Artery forceps* in common use are those known as Spencer Wells', Kocher's, and Mayo-Oschner's. *Scissors* may be straight, curved on the flat, or angled, and the points may be sharp or blunt. *Needles* may be straight, curved, or, less commonly, half-curved; for skin sutures they have either triangular points or flat ones (Hagedorn's needles); for intestinal stitching they have round bodies, to prevent them cutting through the delicate tissues.

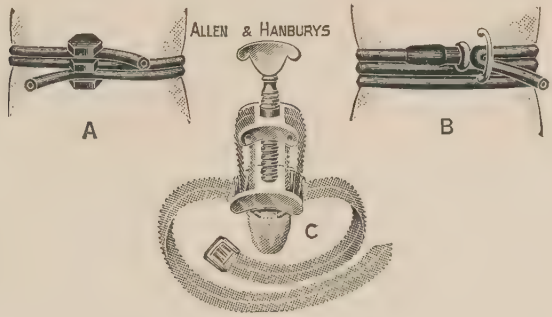
A *tourniquet* is used to prevent or arrest hæmorrhage. Before one is applied, the limb should be emptied of blood as thoroughly as possible by raising it for a few minutes,



Common Surgical Instruments.

A. Amputation Knife. B. Curved Probe-pointed Bistoury. C. Scalpel. D. Parker's Tenotomy Knife. E. Director. F. Dissector and Scoop. G. Sinus Forceps. H. Bowl Forceps. J. Cheadle's Steriliser Forceps. K. Mayo-Oschner's Artery Forceps. L. Spencer-Wells' Artery Forceps. M. Hagedorn's Suture Needles. N. Suture Needle, triangular point. O. Intestinal Suture Needles. P. Aneurism Needle.

or by applying an Esmarch elastic bandage from the extremity towards the trunk. Tourniquets are of two varieties —viz., the screw tourniquet—*e.g.*, Petit's, consisting of a webbing belt, which after being buckled round the limb can be loosened and tightened by means of a screw connecting two plates; and the elastic-tubing tourniquet, which is much more often used, but which cannot be slackened gradually like the screw tourniquet to see whether all cut vessels have been tied. Those most in favour are the Samway's or anchor pattern, and the Foulis, in which the



Tourniquets.

A. Foulis, with Boxwood Clip. B. Samway's Anchor Pattern. C. Petit's.

tubing when stretched is slipped into a groove in a block of wood. In case the tourniquet in use breaks, it is advisable to have another in reserve.

4. **Dressings, Drums, Ligatures, and Drainage Tubes.—**

(*a*) *Dressings.*—Sterilised or aseptic dressings, composed of absorbent material, have to great extent taken the place of those impregnated with antiseptics, for, in addition to being less irritating, they are more absorbent, and removal of moisture from a wound constitutes the best means of preventing sepsis. They are sterilised by steam in a high-pressure steriliser. The substances chiefly em-

ployed are gauze, butter-muslin, absorbent cotton, Gamgee tissue, lint, wood-wool, and peat-moss. *Gauze* is placed next the wound as it has considerable capillarity and dries out quickly. *Absorbent cotton* is less permeable, although very absorbent, and is used outside the gauze. A thin layer of *gray or non-absorbent wool*, which is much less absorbent owing to the fatty matters not having been removed, is useful as the outermost dressing in children, to prevent infection from the outside by urine in cases where wetting is liable to occur. *Gamgee tissue* consists of sheets of absorbent cotton-wool enclosed between two layers of gauze. *Lint* is not much used now as a dressing, but is chiefly employed as a base on which to spread ointments. *Wood-wool* is one and a half times as absorbent as absorbent cotton. *Sphagnum-moss* will absorb twenty times its own weight of water and is an excellent deodoriser; it is thus particularly adapted as a dressing for the absorption of foul-smelling discharges.

(*b*) *Drums* of plated metal, in various shapes and sizes, are used for holding dressings, towels, coats, &c., for sterilisation. In the larger ones are placed the more bulky articles; in the smaller, the dressings, bandages, gloves, &c. A common form is a circular box, in the sides of which are numerous perforations, which can be closed by a sliding band; a drum-stand is sometimes provided with a pedal arrangement for opening the lid. The lid having been clamped down and the perforations opened, the drum is placed in the high-pressure steriliser for at least thirty minutes. At the end of this time the drums are removed and the perforations closed; the contents are now ready for use. In packing the drums, care must be taken not to fill them too tightly in case the steam does not penetrate. The number and size of the drums vary in different theatres; they may be conveniently used as follows: In one division of a small drum is stored gauze, cut into pieces six inches square; reels of gauze tape and the gauze packs, to be described later, are placed in the other division. Bandages and binders are kept in a separate small drum. The larger

drums are filled, one with towels, another with swabs, while a third contains cotton-wool, cut into pieces of various sizes. In addition a large drum is needed for coats and aprons, and smaller ones for masks, caps, and gloves.

(*c*) *Ligatures and Sutures.*—A ligature is the material used for tying round a blood-vessel or pedicle. A suture is the material used with a needle in approximating parts and forming a seam. Some of the substances used are absorbed by the living body when embedded in the tissues, such as catgut and kangaroo tendon ; others, such as silver wire, silkworm-gut, silk, linen thread, and horse-hair are non-absorbable.

Catgut in obtained from the fibrous coat of the intestines of sheep ; it is made in fourteen sizes, ranging from ooooo, which is the finest, up to 8, oo to 3 being those commonly employed. Owing to the source from which it is obtained raw catgut is always infected with micro-organisms ; it is said that it sometimes contains the tetanus bacillus. It is spoilt by boiling in water, and has therefore to be sterilised by chemical antiseptics. The treatment must obviously be thorough, and the catgut should be used impregnated with an antiseptic. *Iodised catgut* is prepared by immersing well-scrubbed catgut in an iodine solution—for example, a mixture of equal parts of tincture of iodine and distilled water, or equal parts of tincture of iodine and proof spirit —for at least eight days, then transferring it to a jar and just covering it with a solution containing half the amount of iodine, in which it may be kept indefinitely. It is safer, however, to obtain it already prepared in sealed glass tubes from a manufacturer of repute.

Catgut prepared in this way will be dissolved in the tissues in from one to three weeks according to thickness. If it is desired that it should remain longer, it should be hardened with chromic acid. *Chromicised catgut* is prepared by sterilising the catgut in a boiling saturated solution of ammonium sulphate for twenty minutes, removing it from the solution with sterile forceps and rinsing it in sterile water, afterwards soaking it for twenty-four hours in a

sterile aqueous solution of chromic acid, 1 in 10,000. It is kept in an alcoholic solution of iodine. It also can be bought in glass tubes.

Kangaroo tendon is prepared from the strong tendon of the tail; it is only slowly absorbed, and is very strong. It does not stand boiling, and is usually obtained ready prepared in glass tubes.

Silkworm-gut, or fishing-gut, which is the fibre drawn from the silkworm when ready to spin the cocoon, is an excellent suture material, and may be sterilised by steam or by boiling in plain water for half an hour; soda solution should not be used, as it renders the silkworm-gut soft and impairs its strength. Three sizes are usually supplied —fine, medium, and strong.

Silk may be procured in skeins in sizes varying from No. 1 up to No. 14. It is sterilised by boiling for thirty minutes in plain water and preserving in a solution of biniodide in spirit (1-1000) with the addition of 5 per cent of glycerine. Some surgeons boil their silk immediately before use; it will not bear repeated boiling, however, as it becomes brittle and unreliable.

Linen thread is sterilised in the same way as silk.

Celluloid thread, which can be similarly sterilised, is made of fine hemp coated with celluloid, and forms an excellent substitute for silk; it is strong and cheap.

Horse-hair from the tails of horses is used especially for fine cutaneous sutures for exposed parts. It should be well washed with soap and water, boiled for five minutes, and stored in a solution of carbolic acid, 1 in 20; it will not stand repeated boiling.

(*d*) *Drainage-tubes* are usually made of rubber: occasionally glass, metal, and decalcified bone are employed. They may be sterilised by boiling or by steam. A variety of tubes should be kept ready sterilised in a jar containing 1 in 20 carbolic acid in water, or in a mixture of equal parts of glycerine and alcohol containing 5 per cent of carbolic acid; the tube should be dipped in sterile water to remove the carbolic acid before being used. Dry rubber articles

should be kept thickly powdered with French chalk or sulphur.

5. **Sponges.**—(*a*) *Marine sponges* are by no means easy to sterilise, since they are at once spoiled by boiling; as a consequence they have fallen greatly into disuse. For operations in the mouth and in certain abdominal operations, however, good marine sponges are most useful, and it is well to obtain some ready prepared.

They may be stored in suitable glass jars in a 1 in 20 solution of carbolic acid.

Before an operation, the sponges are removed from the jar with a pair of sterilised forceps and thrown into a basin of warm water to get rid of the carbolic acid. They are then squeezed out with the gloved hand and placed in either saline solution, sterilised water, or an antiseptic solution, from which they are taken by the surgeon or his assistant as required. When they become saturated during the operation they are thrown by the surgeon into a bowl of sterile water placed close at hand or into a weak solution of washing-soda; the nurse, wearing sterilised rubber gloves, squeezes and manipulates them until clean, and replaces them in the original basin.

Any sponges that have been used for a foul wound, or that may have come in contact with pus or fæces, should be destroyed. After an aseptic operation, however, the sponges, may be used again; they should be thoroughly washed at once in cold sterilised water, and placed for twenty-four hours in a warm saturated solution of borax, which dissolves out the blood. They should then be well washed in warm sterile water and finally stored in jars in 1 in 20 carbolic solution.

(*b*) *Substitutes for Sponges.*—*Swabs*, about $2\frac{1}{2}$ inches square, are made of gauze or butter-muslin, with the cut margins folded in and tacked together so as to leave no loose threads which might be left in the wound. For abdominal operations *pads* composed of eight layers of gauze or butter-muslin with the edges folded in and sewn are often required; they should have a piece of tape about

12 in. long sewn to one corner so that they may be anchored by clip forceps; convenient sizes are 4 by 6 in. and 6 by 8 in. For keeping back the intestines in abdominal section *packs* of gauze are generally used; they are made by folding a single wide piece of the material longitudinally with the edges turned in; the edges should be hemmed and the packs kept rolled like a bandage; they should be made 3 and 5 in. wide, and kept in lengths of from 2 to 8 feet. These sponge substitutes are sterilised by steam with the dressings.

6. **Other Articles.**—(*a*) *Bowls and trays* should be boiled in their special steriliser, or over a gas ring in an enamelled pail.

(*b*) *Macintoshes and Towels.*—Towels are packed in drums or calico bags, and sterilised by steam like the dressings. At an operation macintoshes are sometimes placed under the sterilised towels. Those made of Billroth's cambric, pegamoid sheeting, or jaconet, may be sterilised by steam, and batiste by boiling; the thicker macintoshes formerly used could not be boiled or steamed, but were scrubbed with soap and water and carbolic lotion. Soda should not be applied to any of these materials.

(*c*) *Water.*—Water that has been boiled for five minutes in a covered vessel may be regarded as sterile. In some theatres a special apparatus for supplying sterilised hot and cold water is provided. In others there are two copper vessels, lined with tin and heated by gas-burners; one is kept boiling during the operation, the other is boiled some hours before and allowed to cool.

(*d*) *Normal Saline Solution.*—The stock solution should be made double the normal strength by dissolving 160 grains of pure table salt in each pint of distilled water. It is boiled some hours before the operation and allowed to get cold; for use it is mixed with an equal quantity of hot sterile water. Sterile sodium chloride can be bought in concentrated solution, or as a powder, in sealed tubes; these tubes, before being broken, are sterilised by boiling,

and the contents can then be diluted to the required extent with sterile distilled water.

Germicides and Antiseptics.—There are a great variety of drugs which, when used in a sufficiently concentrated form, possess the power of killing germs (*germicides* or *disinfectants*), while in weaker solutions they are able to prevent their growth (*antiseptics*).

1. **The Phenol Group.**—(*a*) *Carbolic Acid,* or *Phenol,* which is obtained from coal-tar, is a crystalline substance soluble in water, alcohol, or glycerine. For lotions it is usually dissolved in water sufficient to bring it to a strength of 1 in 20. When intended to act as a germicide, it must not be used in a weaker solution. This strength is useful for disinfecting excreta, but it is too strong for application to wounds. For such it should be diluted to 1 in 40, or 1 in 60; occasionally the pure acid is applied as a caustic to very foul and sloughing wounds. The first symptom of carbolic-acid absorption is a dark olive-green appearance of the urine, which is readily produced by the application of carbolic compresses to the skin of young children; the drug should be at once discontinued. A solution of carbolic acid as strong as 1 in 20 blunts knives if they are left in it for any length of time, but otherwise has no injurious effect on metal instruments.

(*b*) *Lysol, Creolin, Cyllin, and Izal* are other coal-tar derivatives. Lysol (Liquor Cresol Sap.) is a solution of tar oils in soap, and is used in 1 or 2 per cent solutions for douching, or in undiluted form for sterilising knives before operation. Both cyllin and izal are more powerful antiseptics than carbolic acid, although much less toxic.

(*c*) *Acriflavine,* or *Flavine,* is used, in 1 in 1000 solution in normal saline solution, for syringing infected wounds or for soaking gauze for a surface dressing. It does not injure the tissues or interfere with phagocytosis, but is only moderately powerful.

(*d*) *Violet-green* is sometimes used for sterilising the skin before operation. The solution contains a mixture of methyl violet and brilliant green, dissolved in methylated

spirit and water. As it stains the fingers, the nurse should wear rubber gloves in applying it ; it spoils any linen with which it comes in contact.

2. **The Mercury Group.**—(*a*) *Perchloride of Mercury*, also known as corrosive sublimate, acts as a powerful germicide when used as strong as 1 in 1000. For washing out cavities, where there would be a risk of absorption, 1 in 8000 is strong enough. It cannot be used with soap. Perchloride of mercury is intensely poisonous, producing vomiting and diarrhœa, and, if enough has been absorbed, collapse and death. Metal instruments should never be placed in a solution of it, otherwise they become black, owing to the mercury being deposited on them.

(*b*) *Biniodide of Mercury*, which is really a double iodide of mercury and potassium, is used in the same way, and of the same strength, as the perchloride, over which it has many advantages. It is much less irritating to wounds and to the skin. It does not coagulate blood, which perchloride does. It is a more powerful germicide, more penetrating, but less toxic. It is much less damaging to instruments. It can be incorporated with soap, and is now one of the most commonly used antiseptics. It has one disadvantage, namely, it is more expensive. It is used only as a lotion ; there is no corresponding gauze or wool.

3. **The Iodine Group.**—(*a*) *Iodine* is a solid, sparingly soluble in water, but dissolving freely in the presence of potassium iodide, also in alcohol. Tincture of iodine is a 2.5 per cent solution of iodine and potassium iodide in 90 per cent alcohol ; it should not be more than a month old, as it does not keep well. If made with methylated spirit, the fumes developed are irritating to the eyes. A weak solution, a drachm of the tincture to a pint of water, is used for irrigation. Iodine is used in the sterilisation of catgut, and for painting the skin before operation. It is probably the safest and most powerful of antiseptics.

(*b*) *Iodoform* is a yellow powder, with a characteristic and very powerful odour. It hinders the development of bacteria, and arrests putrefaction. It is specially useful

in the treatment of lacerated wounds where sloughing is likely to occur. It is also applied to tuberculous sinuses, and, in the form of iodoform emulsion (made by mixing 10 per cent of finely powdered iodoform with sterile glycerine and water), is frequently injected into tuberculous joints. It is sometimes diluted with 2 or 3 parts of powdered boric acid, as a larger quantity can then be used—*e.g.*, in filling small cavities in bone—with much less risk of poisoning the patient.

(*c*) *Iodol*, *Aristol*, and *Loretin* are powders having a similar action to iodoform without its disagreeable smell.

4. **The Chlorine Group.**—These are represented by *Eusol*, *Chloramine-T*, and *Dakin's Solution*. "Milton" has a similar composition. Their antiseptic action depends on the liberation of hypochlorous acid; they are all unstable, so the lotion must be frequently applied. They are also powerful deodorants, and dissolve any dead tissue in a wound, so hastening the healing process. They are non-irritating, and are used for wet dressings, for continuous or intermittent irrigation, and for baths. The stock solutions should be kept in the dark, and fresh supplies should be made at least once a week. Dakin's Solution is probably the best. Eusol is made by adding 25 grammes of "Eupad" (a mixture of equal parts of fine bleaching powder and boracic acid) to 1 litre of water, and filtering after shaking and standing for a few hours.

5. **Miscellaneous Antiseptics.** — (*a*) *Alcohol* and *Methylated Spirit* are powerful germicides, and are used in the disinfection of the hands and skin.

(*b*) *Peroxide of Hydrogen* is useful for cleansing and sweetening suppurating wounds. It is a solution of hydrogen dioxide in water; it is a colourless non-poisonous liquid which, when brought in contact with blood or pus, produces a frothy effervescence due to the evolution of oxygen; the bubbles of gas tend to force the discharge to the surface.

(*c*) *Formalin* is a 40 per cent solution of a gas called formaldehyde. It is a powerful disinfectant and caustic,

and irritating when inhaled. In the form of a 1 per cent spray, it is much used for disinfecting dwelling-rooms after the removal of a case of infectious disease. It is used for hardening catgut, and in 1 in 1000 solution for syringing the throat and irrigating septic wounds.

(*d*) *Boric Acid* is a very feeble antiseptic, but possesses the advantage of being practically non-poisonous, so that it can be used for washing out large wounds and cavities where a more powerful germicide would be inadmissible. Although boric acid is soluble 1 in 3 of boiling water, it is soluble only 1 in 25 of cold water ; thus 1 in 25 is a saturated solution and forms the stock lotion. As commercial boric acid is not sterile, and boric acid, although an antiseptic, is not a germicide, it is necessary to boil the solution to make it sterile. To make stock boric lotion, therefore, allow 320 grains for every pint of lotion ; stir the crystals up in a bowl with sufficient boiling water to dissolve them ; boil for five minutes, and add cold sterilised water to the required amount.

(*e*) *Other antiseptics* are numerous ; among the best known are protargol (a protein compound containing silver), picric acid (used in the primary dressing of burns), salicylic acid, and friar's balsam.

Antiseptic Dressings.—*Carbolic gauze*, which is of deep yellow colour and rather harsh texture, contains about 5 per cent of carbolic acid. It is not very absorbent, and is now rarely used.

Alembroth gauze and wool, which are dyed a bright blue colour, contain perchloride of mercury combined with chloride of ammonium. They sometimes act as irritants to the wound, and are not so absorbent as plain gauze and absorbent wool.

Double cyanide gauze contains cyanide of mercury and zinc, and is dyed a pale lavender colour. It is non-irritant. It is usually moistened with carbolic lotion (1 in 20) before application.

Iodoform gauze is the most valuable of antiseptic dressings, and is used for dressing sinuses, or packing the rectum

or vagina. It is made by rubbing fine iodoform into sterile gauze with a gauze pad. Iodoform wool is also made, but is not much used.

Boric lint and wool contain boric acid, and are coloured pink. They are used especially in making moist compresses for cleansing ulcers and suppurating wounds.

Salicylic wool contains salicylic acid, and is non-irritating, though powerfully antiseptic. It has generally a faint pinkish tint, and is useful, especially in regions which are apt to be sweaty, the axillæ, groins, and toes.

CHAPTER XXX.

ON MATTERS CONNECTED WITH OPERATIONS.

If the temperature is raised above the normal, operations are usually not undertaken unless they are urgent. In cases of urgency menstruation is no bar, but otherwise the date of the operation is best arranged to be as long before a menstrual period as possible. It is an advantage for patients to be some days in the ward before operation; if in poor health they should be strengthened by stimulating food. Consent for operation should always be obtained from the patient himself if an adult, or from the parents or responsible relatives in the case of a child.

1. Preparation of Patients for Operation.

For General Operations.—A thorough bath, or bed-bath, should be given on the afternoon before the operation. To lessen the tendency to vomit, the stomach should be empty when the anæsthetic is administered, but it is not necessary to keep the patient without food for so long, or to purge him so thoroughly, as was the custom some years ago. Drastic purgation is, indeed, harmful. The patient's usual aperient, or an ounce of castor oil, should be given about thirty hours beforehand. Except in rectal cases, no enema is needed unless the bowel is thought to be still loaded, in which case a small soap-and-water enema may be given the evening before the operation. Light diet—milk, soup, eggs, and custards—is now usually allowed to within three or four hours of operation.

Purgation and starvation are particularly to be avoided in *children*, on account of their special liability to acidosis as a result of the anæsthetic (p. 531). Fraser recommends an enema about twelve hours before the operation, and gives food which leaves little residue up to two or three hours of the anæsthetic. If acetone is present in the urine (the urine should always be tested for albumin, sugar, and acetone), the operation should be postponed, if possible, until the acetonæmia has been corrected by the administration of glucose 1 drachm, or bicarbonate of soda 30 grains, in an abundant supply of water, four-hourly. To assist in preventing acidosis, children may be given barley sugar or the like to suck after operation ; some surgeons give it before also.

For Special Operations.—*Abdominal Section.*—The pre-operative diet should leave little residue. Gastric cases usually require gastric lavage once or twice before operation, and it is well to feed them on sterilised food for a day.

Excision of the Rectum.—For several days the diet should be one leaving a minimum residue (*e.g.*, peptonised milk, eggs, raw meat juice, meat extracts), and the rectum should be washed out daily with weak Condy solution. Bismuth, opium, and salol may be given for two days before the operation, and three days after.

Hæmorrhoids.—The ordinary general treatment suffices if an enema is included. Half-an-hour before the operation a suppository of morphine and belladonna ($\frac{1}{2}$ grain of each) is usually introduced.

Genito-urinary cases.—The renal function is often impaired in diseases of kidney, bladder, prostate, and urethra. Milk, fish, and eggs are the best diet ; the skin should be made to act by warm baths, and the patient should drink at least 2 pints barley-water during the day. The bowels must act well. If there is pyuria, urotropine may be given or the bladder washed out.

Preparation of the Site of Operation.—This should be done after the bath. If two nurses are available it is a convenience—one, the non-aseptic nurse, waits on the

other, opens bottles and drums, and touches non-aseptic articles only; and the other, the aseptic one, handles only aseptic things. Both wash their hands before beginning, but the aseptic nurse sterilises her hands by scrubbing with soap and water and soaking them in biniodide of mercury (1-2000), and also dips her hands in this lotion between the stages of the preparation. If only one nurse is available, she should arrange everything so that she need handle only aseptic articles once she has rendered her hands aseptic.

The procedure varies in different hospitals; the object is to render the skin for a wide area round the proposed site of operation as sterile as possible without irritating it, and the following methods are among those commonly adopted :—

(*a*) *In ordinary cases.*

1. Shave the part and wash it with soap and water to remove visible dirt. This may be done either by the non-aseptic nurse or by the aseptic nurse before she sterilises her hands. A nail-brush may be necessary in the case of adults, but should not be used in preparing children, as it is apt to injure their more delicate skin.
2. The nurses then arrange aseptic towels to cut off the part to be prepared from the rest of the body and from the septic bed-clothes; the aseptic nurse handles the towels, while the other holds the limbs and arranges the bed-clothes.
3. The aseptic nurse rubs the area with turpentine to remove scabs, grease, and germs. The bottles and bowls are handled by the other nurse.
4. She washes off the turpentine rapidly and thoroughly with methylated spirit. This also helps to dehydrate or dry the skin, and thus allow the next reagent used to penetrate more deeply.
5. She rubs the site with biniodide of mercury in spirit (1-500), or paints with tincture of iodine, or picric acid, or violet-green. This acts as a disinfectant.

6. She applies dry sterile gauze and a bandage, the non-aseptic nurse again holding the limb. Tincture of iodine will usually be applied on the operation table in these cases.

(*b*) *If an open septic wound is present*—do 1 to 5, but instead of applying sterile gauze, apply a compress of four layers of lint soaked in biniodide of mercury *in water* (1-2000), and cover with gutta-percha protective and a loose bandage. This should be changed three hours before the operation.

(*c*) *If it is an emergency case, or the site is very tender, or there is danger of rupturing an abscess by washing*—do none of the above, but keep the site dry and paint with tincture of iodine and cover with sterile gauze. It is important to note that tincture of iodine is not effective unless the skin is absolutely dry.

General.—To prevent shock the patient should be fitted with a warm sleeve-jacket, opening behind, pants and stockings; these should be put on about half an hour before operation. The bladder should be emptied naturally immediately before going into the theatre.

False teeth should be removed, and care taken that there is nothing tight around the neck or waist. The hair should be parted and plaited into two tails.

Hot-water bottles should be placed in the bed (p. 69) as soon as the patient leaves it, and a blanket put at the fire to warm.

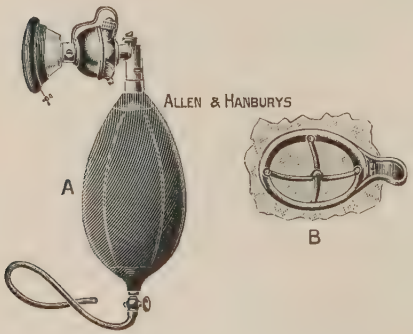
II. Anæsthesia.

The anæsthetic is usually administered in the theatre or in an ante-room, the patient being conveyed there from the ward on a wheeled trolley. To lift the patient from the bed to the trolley, or from the latter to the table, three persons can manage if *all* stand on the same side, one taking the head and shoulders, the second the trunk, and the third the legs. Or two can stand on each side.

There are three forms of anæsthesia—general, spinal, and local.

1. **General Anæsthesia.**—The drugs most commonly used are nitrous oxide, nitrous oxide and oxygen, ethyl chloride, chloroform, and ether.

(*a*) *Nitrous Oxide* is a safe anæsthetic, and as it may be given to a patient in the sitting position, is largely used in dentistry. The patient should have had no food for at least two hours. It produces cyanosis and stertorous breathing, and the anæsthesia only lasts about thirty seconds. The apparatus consists of two side-valve cylinders, each yielding 25 gallons of gas, with stand, double union, and foot-key; the union is connected by a rubber tube to a 2-gallon bag, and this is fitted with a face-piece which has a metal-valved stop-cock.

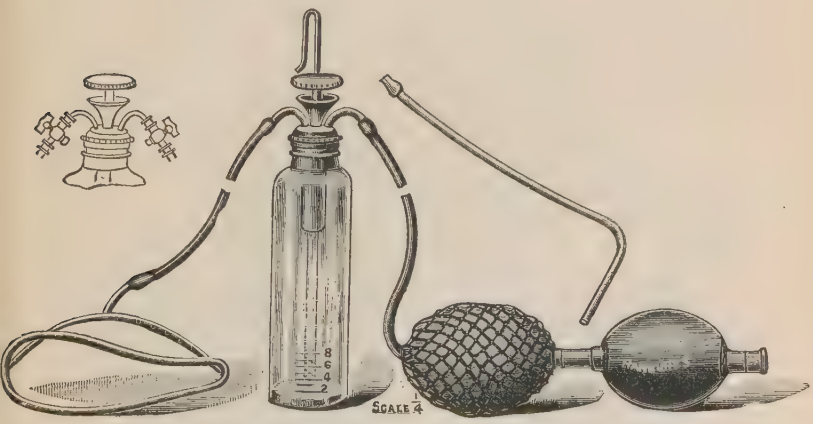


A. Hewitt's Inhaler, for Gas and Ether.
B. Schimmelbusch's Inhaler.

(*b*) For *Nitrous Oxide and Oxygen* a special apparatus is needed. Boyle's outfit consists of a wooden box containing four cylinders of nitrous oxide and one of oxygen. Each gas cylinder has a fine reducing valve, and the rate of escape of the gas can be easily controlled. The oxygen cylinder has a reducing valve and a pressure gauge, so that the amount of oxygen present in the cylinder can easily be seen. Rubber tubes connect one gas cylinder and the oxygen cylinder with two metal tubes passing into a bottle containing water, through which the gases are allowed to bubble on their way to the bag on the face-piece of which is a three-way stop-cock. The proportion of gas to oxygen can be regulated to meet the requirements. This form of anæsthesia

is eminently suited to patients who are in a septic state or who are enfeebled by disease.

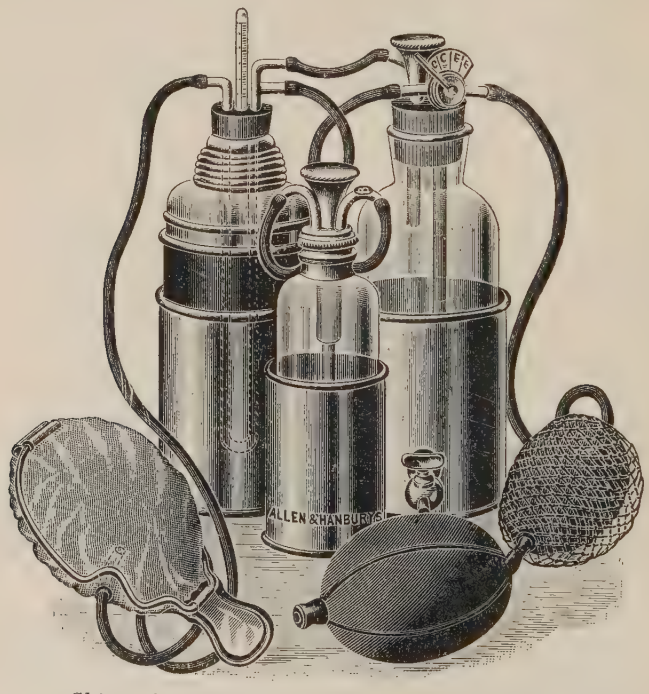
(*c*) *Ethyl Chloride* acts with great rapidity, producing an anæsthesia lasting about 75 seconds, but it is not so safe as nitrous oxide. It is supplied in tubes graduated in cubic centimetres, 2 to 5 c.c. being used according to the age and sex. The patient may be in the lying or sitting position. A special ethyl chloride inhaler is usually used. In operation on the teeth or tonsils a mouth prop or gag is placed in position before beginning.



Junker's Inhaler, with Face-piece for Flannel Cover, and a Metal Mouth-tube.

(*d*) *Ether* may be administered by the closed or the open method, or it may be given intratracheally, or by rectum. In the *closed method* a Hewitt's inhaler (consisting of a face-piece, an ether chamber, a three-way stop-cock, a large gas-bag, and a small ether bag) is used. When ether is preceded by nitrous oxide, the gas-bag is fitted to the top of the inhaler, being replaced by the ether one when the patient approaches anæsthesia. Instead of nitrous oxide, ethyl chloride is sometimes used as a preliminary to ether. In the *open method*, a Schimmelbusch's mask,

covered with several layers of gauze, domette, or lint, is often used, the ether being dropped on almost continuously. It takes longer to obtain anæsthesia by this method, and it is therefore usually preceded by a hypodermic injection of morphine gr. $\frac{1}{6}$ and atropine gr. $\frac{1}{120}$, given



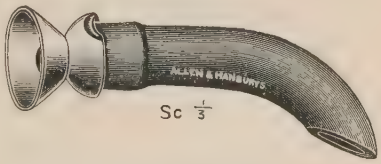
Shipway's Warm Ether and Chloroform Apparatus.

three-quarters of an hour before operation. Sometimes the ether is warmed, as in Shipway's apparatus.

(*e*) *Chloroform* is given on an open mask, Skinner's or Schimmelbusch's, covered with only one thickness of flannel, lint, or domette, the chloroform being dropped on from a drop-bottle. The mask is kept a little distance from the face to allow of a free admixture of air. Junker's inhaler

(consisting of a graduated bottle fitted with two tubes, one of which is provided with a rubber bulb, the other with a mouth tube) is of service in operations on the tongue, nose, or pharynx. By it chloroform vapour mixed with air can be pumped into the mouth. *The apparatus must be tested before use* to see that it is properly connected up, otherwise liquid chloroform may be pumped into the mouth. Chloroform is generally regarded as less safe than ether; C.E. mixture (1 part chloroform, 2 parts ether) and A.E.C. (1 part absolute alcohol, 2 parts chloroform, 3 parts ether) are therefore often substituted.

The patient should never be propped up when under the influence of chloroform, lest heart failure occur. Faintness should be treated by rubbing the face vigorously, lowering the head and raising the pelvis, flipping with wet towels, and fomenting the precordia. Vomiting is not uncommon when the patient is beginning to come round; during vomiting the jaw should not be held forwards, as this increases the risk of vomit entering the larynx.

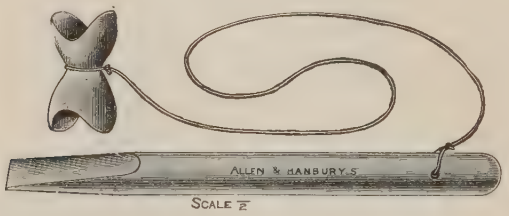


Artificial Airway.

2. **Spinal Anæsthesia,** by injection of stovaine or novocain into the subarachnoid space of the spinal canal, is sometimes used, especially for operations below the level of the umbilicus. It lasts from three-quarters to one hour, and prevents all shock. The injection is made in the lumbar region of the spine with strict aseptic precautions, the skin being sterilised at the same time as the field of operation, and the patient prepared as for a general anæsthetic. To remove the disadvantage of consciousness being unimpaired, spinal anæsthesia is sometimes combined with "twilight sleep," morphine gr. $\frac{1}{4}$ and scopolamine gr. $\frac{1}{200}$ being injected $1\frac{1}{2}$ hours before the operation, and scopolamine gr. $\frac{1}{100}$ an hour later.

3. **Local Anæsthesia** may be induced by freezing with

the ethyl chloride spray, the skin having first been washed with ether to remove grease ; or, in the case of a mucous membrane, by painting with a 5 or 10 per cent solution of cocaine, or by local injection of weak solutions ($\frac{1}{10}$ to 1 per cent) of eucaine or novocain, which can be boiled just before use. Sometimes adrenalin is used to aid these anæsthetics. Local anæsthesia is sometimes used in combination with general anæsthesia ("anoci-association"), to eliminate shock in special cases.



Mouth Prop and Boxwood Wedge.

III. Duties in the Operating Theatre.

During an operation at least two nurses are necessary in the operating theatre—the "aseptic nurse," who is to handle only aseptic things, and the "non-aseptic nurse," who will deal with those articles which are not aseptic. The theatre sister may take on the duties of the aseptic nurse entirely herself, or she may be assisted in these duties by a senior nurse. A junior nurse usually acts as non-aseptic nurse ; she wears a cap and overalls, and should be practically as sterile as the other except for her hands ; she must on no account touch with her hands anything which has been sterilised. If she does so, that article is regarded as unclean, and must again go through the complete process of sterilisation. The aseptic nurse must be equally careful to touch nothing that has *not* been sterilised, as for instance her own face. Should she do so, she can

take no further part in the operation until her hands have been again sterilised. At a hospital, two or more non-aseptic nurses are generally provided in the theatre.

General Duties.—The theatre sister is responsible for the cleanliness of the theatre, together with the anæsthetic and instrument rooms, and for the instruments and furniture contained in them, and she keeps the keys of these rooms, which should always be kept locked when not in use. She instructs her assistants in their duties, and sees that they properly prepare the swabs, dressings, gloves, caps, and gowns, saline and other lotions, required for future operations. She has charge of the instrument cabinet, and takes care that the needles and knives are sharp and all instruments in good working order. She personally prepares all ligature and suture material in sufficient quantity, and maintains them in an aseptic condition. After the operations are over she sees that everything that has been used is properly cleaned and restored to its place, and that all stains are removed from the towels, gowns, &c., before they are sent to the laundry. She also arranges that specimens to be kept are sent to the pathological laboratory, properly labelled.

The nurses who act as her assistants make the swabs, pads, gauze packs, plaster bandages, &c., and cut the dressings. They prepare the packages of swabs, dressings, towels, macintoshes, gloves, caps and gowns, for sterilising. After a porter or maid has flushed and cleansed the floor of the operation-room, they dust, wash, and polish the furniture. They also wash the trays, basins, and glassware, and clean the sinks and lavatory basins.

The Duties of the Non-aseptic and Aseptic Nurses are conveniently divided into those required before the operation, at its commencement, during the operation, at its end, and after the finish.

A. Before the Operation :—

The Non-aseptic Nurse—

1. Dusts the theatre and its furniture with a cloth damped with lysol or other disinfectant solu-

tion, at least four hours before the operation. Keeps an eye on the temperature of the theatre, which, except in special cases, should be about 65°.

2. Sterilises the trays and bowls.
3. Provides sterile nail-brushes, soap, and other articles for the disinfection of the hands.
4. Arranges the anæthetist's table, placing on it the inhalers, drop-bottles, chloroform, ether, alcohol, vaseline, lint, scissors, tongue-forceps, wedge, gag, artificial air-way, kidney-tray, small pieces of gauze, swabs, swab-holders, and towels, together with a tray containing hypodermic syringe, pituitrin, adrenalin, strychnine solution, brandy, minim-measure, and capsules of amyl nitrite. She sees that the syringe is in working order, and that the oxygen and gas cylinders are in position, with their keys.
5. Fills the hot-water tank of the operating table, gets blankets, and places the waste-pail in position.
6. Sees that there is a supply of hot and cold sterile water and saline solution.
7. Puts on cap and gown.
8. Fills the bowls; in the handling of bowls she must not touch any part of the interior.
9. Lifts the instrument-tray from the steriliser when sterilisation is complete, and carries it to the aseptic nurse.
10. Carries the sterilising drums to the aseptic nurse; opens their lids and closes them again; removes stoppers from bottles and pours out solutions when required.
11. Ties gowns and masks, and adjusts the caps of the surgeons and aseptic nurse.

The Aseptic Nurse—

1. Arranges the tables, &c., in the positions suited to the operation, and helps the non-aseptic nurse.

2. Puts out the instruments, &c., likely to be required, and starts their sterilising.
3. Prepares the saline infusion apparatus.
4. Covers the small tables with sterile towels, and arranges the drums of dressings and swabs.
5. Renders her hands aseptic, puts on gown, cap, and rubber gloves.
6. Removes instruments from the steriliser-tray, and arranges them.
7. Threads the needles and arranges the ligatures.

B. At the Commencement of the Operation :—

The Non-aseptic Nurse—

1. Helps to place the patient on the table and arranges the blankets.
2. Removes bandages and outer dressings from site of operation.
3. Holds up the limb while macintoshes and towels are being placed round it.
4. Pours out biniodide, soap solution, iodine or spirit when required to do so.

The Aseptic Nurse—

1. Arranges the sterile towels.
2. Holds the small sterile vessel into which the iodine or other solution has been poured.
3. Hands the instruments first required—*i.e.*, knife, artery forceps, and dissecting forceps.

C. During the Operation :—

The Non-Aseptic Nurse—

1. Keeps the instrument steriliser boiling.
2. Changes the solution in the hand-basins when it becomes necessary.
3. Is prepared to supply hot sterile water or saline solution when asked for it.
4. Picks up, washes, and re-sterilises any instrument dropped.
5. If told to hold a limb, places her hand *underneath* the sterile coverings.

6. Watches the aseptic nurse and does not leave the operating room; she does not attempt to watch the operation.

The Aseptic Nurse—

1. Keeps the surgeon's assistant well supplied with swabs, and closely follows the course of the operation, in order that she may anticipate the wants of the surgeon.
2. Keeps the instruments washed and hands them back to the surgeon quickly.
3. Has ligatures and sutures ready.
4. Keeps clean towels about the field of operation.
5. Keeps count of the artery forceps and sponges when this is necessary.

D. At the End of the Operation :—

The Non-aseptic Nurse—

1. Provides a bowl of sterile water for sponging.
2. Counts sponges, and reports to the sister at once if any are missing.
3. Helps to wrap up the patient and place him on the stretcher.
4. Places a towel and kidney-tray near his head.
5. Sees the patient out of the theatre and hands him over to the care of another nurse.
6. Removes the waste-pail, cleans table and floor, and gets ready for the next operation.

The Aseptic Nurse—

1. Hands sponges for cleaning up, and sterile towel for drying.
2. Hands the dressings.
3. Arranges the instruments and ligatures for the next operation.

E. After the finish :—

The Non-aseptic Nurse—

1. Sees that no instruments (*e.g.*, towel clips) are thrown away in the waste-pail.
2. Rinses the stains out of towels and gowns.

3. Washes the macintoshes with soap and water; washes the bowls.
4. Washes down the furniture after the floor has been cleaned.

The Aseptic Nurse—

1 Cleans and polishes the instruments, and returns them to their places.
2. Washes the gloves.
3. May help to dry or assist generally.

IV. Preparation for Operation in a Private House.

Room.—An airy and well-lighted room, not too sunny, should be selected; it is an advantage if it is large and on the same floor as that occupied by the patient. The amount of preparation will depend upon the time available. If the operation is an emergency one, the less disturbance of dust the better; if not one of emergency, a thorough preliminary cleansing of the room should be carried out two days before the operation.

Thus, *in cases of emergency*, the carpet should merely be covered with a damp sheet, and furniture which is not in the way should not be removed, but covered with clean sheets. Curtains should be drawn aside, window-blinds gently pulled up, and dusty pictures left untouched. If any dusting or cleansing is done, a damp cloth should be used.

In cases where it is possible to arrange a proper cleansing, this should be done two days in advance. All unnecessary furniture, the pictures, carpets, ornaments, curtains and blinds, should be removed. The loose dirt should be removed with damp brushes or cloths, and the floors scrubbed with soda solution. The walls may be wiped over with a cloth moistened with carbolic or cyllin solution, or sprayed with a disinfectant. The furniture remaining should be well washed with similar solution.

It should be ascertained that a suitable temperature can be obtained by means of a fire or oil stove. A large piece of oil-cloth beneath the table is useful in protecting the floor. A sheet should be pinned across the lower part of the window if the room is overlooked.

Furniture.—The following furniture is needed : A washing-stand with two basins, an operation-table, and three or four small tables (chairs will do for some purposes if enough tables are not available) for the anæsthetist's apparatus, the surgeon's instruments and lotions, the swabs, &c., and the dressings ; these tables should be covered with sterile towels. A large bucket for emptying slops, and a foot-bath beneath the operation table to receive the used swabs and lotions, and in some cases a chair for the operator, should also be provided.

If the surgeon does not provide a portable *operation-table*, one may be hired, or a kitchen table without leaves may be used, or two smaller ones arranged in the form of a T. The table is covered with a folded blanket, then with a macintosh and a clean turkey-towel or sheet.

Other Articles required are basins, bowls, and tray or shallow baking-dish, all of which can be boiled with soda in the kitchen copper or in an enamelled pail, and then placed mouth downwards on a table covered with a sterile towel (if for any reason some of these articles cannot be boiled, they should be washed, dried, and then "flamed," *i.e.*, rinsed in methylated spirit which is then set alight) ; towels which have been sterilised by boiling and wrung out ; two nail-brushes, boiled in soda solution ; soap and methylated spirit ; razor ; clean aprons, or nightshirts to use as gowns ; hot-water bottles ; and a pot or fish-kettle for boiling instruments. There must also be some sterile normal saline solution and an abundant supply of sterilised cold and hot water ; the simplest way to provide the cold water is to sterilise a few large jugs with boiling soda solution, fill the jugs with boiling water, and tie towels over their mouths and allow to cool ; hot water prepared just before the operation may be kept in the same way. There

should be available some carbolic lotion, tincture of iodine, and biniodide soloids.

The surgeon will probably bring his own sterile *dressings*, but if this is doubtful it is well to have a supply of iodoform gauze, absorbent cotton wool, adhesive plaster, and a few bandages. The instruments can be laid in the shallow dish or on a sterile towel.

The *preparation of the patient and of the site of operation* will be the same as if the operation were to be performed in a hospital.

V. Nursing after Operations.

Warmth.—Hot-water bottles have been previously placed in the bed, and if there is any shock these should now be arranged near the patient, but *not too near*. Care should be taken that the bottles are completely covered with flannel and placed outside the inner blanket, in order to avoid the *risk of burning* him while in a state of semi-consciousness. Indeed, some surgeons, when the patient returns to bed, have the hot-water bottles taken away until he has come round from the anæsthetic. When he has recovered from the shock, the heat may be found to make him restless, and the bottles should then be removed.

Posture.—Until the narcosis produced by the anæsthetic has passed off, the patient should be kept recumbent, with the head low and turned to one side to avoid the risk of vomited matter entering the larynx; if a pillow is used, it should be a thin one. Speaking generally, he should be allowed to assume in bed the position of greatest ease and comfort, provided this position is not harmful. It is said that vomiting is less likely to occur if he lies on his right side, the knees being bent and a pillow placed behind the shoulders to prevent him from rolling back. If he has to be kept on his back, a pillow beneath the knees or a small one under the hollow of the back will often add to his comfort. Under no circumstances should he be left alone

until the complete return of consciousness, lest in the nurse's absence he be choked through vomiting occurring.

If the patient has lost much blood, the foot of the bed should be raised. If he is elderly, or suffering from bronchitis, or has undergone a thoracic or gastric operation, it is advisable, as soon as he is round from the anæsthetic, to prop up the upper half of the mattress so that he is in a semi-reclining position. This allows freer respiration, and hypostatic congestion of the bases of the lungs (*hypostatic pneumonia*) is less likely to occur.

After operation on cases of septic peritonitis the nearly erect position, known as *Fowler's position*, is generally adopted ; this assists fluids to gravitate towards the pelvis, where absorption of septic matters is much slower than under the diaphragm. There are several ways of maintaining this position, but whatever method is adopted care must be taken that the patient does not slip down, for it is useless to have merely the head and shoulders raised. Some hospitals are provided with special beds for the purpose in which the spring mattress is in three sections worked by levers ; in others, back rests, to which thigh supports are attached, are used. An air-ring under the buttocks is comforting and useful in preventing slipping. An emergency method is the following : The head of the bed is well elevated by resting the legs on small tables ; the patient's feet are braced against a board covered with a pillow or folded blanket, and the buttocks are supported on a pillow which has been rolled in a sheet, placed diagonally, the ends of the sheet being firmly pinned to the side mattress-rails.

Shock.—The symptoms and general treatment of shock are described on p. 489. When shock is anticipated, *precautionary measures* are usually adopted. Pre-operative purging and starvation are avoided. Alkalines are given for some days, and a sufficiency of water is allowed before operation. Gas and oxygen, or ether, is chosen as the anæsthetic. An effort is made to avoid chilling of the surface of the body. No unnecessary manipulation or loss

of blood is permitted, and the fluid content of the body is maintained by saline injections into the bowel or under the skin.

Vomiting.—Nausea, retching, and vomiting are frequent after ether, but often they prove temporary and may have spent themselves before the patient is fully conscious. They are likely to be troublesome if the patient has been starved too long, if solids were present in the stomach at the beginning of the administration, if much ether has been used, if much blood, mucus, or saliva has passed into the stomach during the operation, or if the patient is jolted about during recovery. Vomiting after chloroform is less frequent, but when it occurs generally lasts longer and thus proves more distressing. The head must be kept low and turned to one side, so that the vomit escapes at the corner of the mouth.

Persistent vomiting after the use of chloroform, especially in septic disease in children, may be due to **delayed chloroform poisoning** (*acidosis* or *ketosis*). In such cases the patient becomes delirious, the pulse becomes quick and feeble, the temperature is raised, the thirst is intense, and the complexion yellowish, while the urine becomes scanty and contains a substance called acetone. The special *treatment* of these cases consists in giving alkali and glucose by mouth, rectum, or infusion. Glucose (1 dr. four-hourly) or barley sugar is often given to children prior to, and after, operation as a precautionary measure.

In the *treatment of vomiting* frequent rinsing of the mouth with cold water may first be tried; this may be combined with the half-sitting position when the patient has fully regained consciousness. If it persists, it is often advisable, except in operations involving the stomach and duodenum, to give him half a pint of hot water about three hours after the operation, or earlier if he asks for it; this is promptly vomited and the stomach is thus washed out. Later, another drink may be given, and it will usually be retained. A hot fomentation, mustard leaf, or turpentine stupe to the epigastrium may assist, or a teaspoonful

of brandy with a tablespoonful of soda-water may prove effective ; or tincture of iodine or chloretone may be tried. If the vomiting continues for more than five or six hours, the stomach may be washed out with hot water containing sodium bicarbonate, a drachm to the pint. In these persistent cases it will be necessary to stop all drink by the mouth and relieve thirst by rectal infusion (p. 145).

Thirst may be greatly relieved by washing out the mouth with hot water, and frequently cleansing it with glycerine and lemon juice. When the tendency to vomiting is over, sips of hot or cold water may be given every hour. If thirst proves very troublesome, a rectal infusion may be administered.

Pain.—Severe pain must generally be counteracted by the use of *morphine ;* in abdominal cases, however, its use is not desirable. To minimise its constipating effect it is usually combined with atropine. It sometimes appears to cause vomiting. In less severe cases *aspirin* will usually prove sufficient ; this not only relieves the pain, but induces sleep. When pain is mainly due to flatulence, the injection of 1 c.c. of *pituitary extract* will often relieve the discomfort.

Nourishment.—Usually there is neither desire nor necessity for food until the effects of the anæsthetic have passed off. The length of time a patient requires to be kept on scanty diet will depend on the nature and severity of the operation and on his general condition.

After a simple operation solids can often be permitted on the following day. *In cases of moderate severity,* a small cup of tea may be allowed on the day following the operation, if there is no feeling of sickness ; later, soda-water and whey, and broth may be given. *To avoid flatulency,* which may be very distressing, it is well not to give *milk* until the stomach is completely settled ; even then it should be well diluted. In abdominal cases it is better not to give it until the bowels have acted, on account of its constipating effect. Albumin-water, with a little lemon juice and sugar, is an excellent substitute, while raw meat juice is sometimes useful. Milk is less likely to give rise to flatulence if it is

peptonised and flavoured with cocoa. Should this complication develop and be a source of discomfort, the patient may be propped up in bed and given a drop of oil of peppermint on bread to be washed down at once by water.

The quantity of nutriment is gradually increased, and thirty-six hours after the operation Benger's Food, or an egg beaten up in tea, or semi-solids such as custard, junket, jelly, or bread and milk, may be added. On the third day a little boiled fish may be tried, and so on, until about the fourth to the tenth day, according to the condition of the patient, ordinary diet is resumed.

After severe abdominal operations little or no nourishment by mouth should be permitted for forty-eight hours, nutrient enemata being given if required. Some surgeons prefer to give an enema of half a pint of saline solution containing half an ounce of glucose, injected slowly.

Bowels.—Exceptionally it is necessary to keep the bowels quiet for several days after an operation, but generally they should be moved on the second or third day, either by enema or mild aperient. A favourite aperient with some surgeons is calomel in grain doses every hour for four or five doses, followed by white mixture four-hourly until the bowels act. If an enema is preferred on account of vomiting, a simple soap-and-water one may be given, or the following, which is generally very effective: 1 oz. of sodium sulphate and 1 oz. of glycerine in a pint of starch mucilage, with the addition of an ounce of turpentine if there is much flatus; this also is usefully followed by white mixture.

In abdominal cases the need for strong purgatives will be diminished by intramuscular injections of pituitary extract in 1 c.c. doses. If this drug be given every four hours during the first forty-eight hours the normal intestinal peristalsis will be restored, and the bowels will often act thoroughly after a simple enema.

Urine.—It is important that the excretory organs should act freely. The quantity and colour of the urine that is passed after an operation should always be noticed by the

nurse, and a specimen saved if there appears to be the slightest abnormality. In all cases where the kidney or the bladder has been touched this should be done daily, and the whole quantity measured and recorded. When an operation has been performed for the removal of stone from either of these organs, the urine must be very carefully examined.

In consequence of the nervous shock of the operation, the patient may suffer from retention of urine. This is more frequently met with in women than in men. In such a case the nurse must use some firmness, and not pass the catheter unless absolutely necessary, and then only by the surgeon's orders if they can be obtained. This condition may sometimes be relieved by placing a little hot water in the bed-pan before it is given to the patient, or by applying a hot fomentation to the abdomen over the bladder.

It is always a good plan to allow the patient to use the bed-pan once or twice before an operation, the unfamiliar recumbent posture having much to do with the above difficulty.

Local Rest.—In nursing any operation case, or injury, however slight, the nurse must remember and give due importance to the need of local rest. For the first week, at least, the patient ought to do nothing for himself which can put the slightest strain upon the injured part. It is a most important part of a surgical nurse's duties to see that this local rest is secured,—by careful attention to splints which are used for this purpose, and which, if allowed to loosen in any way, will retard the healing of the wound ; by the arrangement of the bedclothes ; by the use of sandbags ; and by the efficiency of the arrangements for moving or assisting the patient to move.

Abdominal Section.—Though the abdomen may be opened for a variety of causes—some much more dangerous to life than others—the nursing of the patients after operation is very similar. The same dangers are to be feared, the same precautions taken, and the same symptoms looked for.

When possible, the patient should be under observation and treatment for a week before the operation takes place. During this time the food should be plain, light, and nourishing, the bowels relaxed by aperients or enemata, and the bed-pan occasionally used so that the patient may become accustomed to it.

If the operation has been prolonged and difficult, the patient may suffer severely from *shock*. In such a case he must be put to bed most carefully, so that he may be shaken as little as possible. A pillow rolled in a draw-sheet should be placed under his knees, and his head kept quite low, one pillow only being used. Hot bottles should be in the bed, separated from the patient's skin by a warm blanket. If the head is cold and clammy hot flannels may be applied to it, and the foot of the bed raised for the first twenty-four hours. *Internal hæmorrhage* (see p. 485) gives rise to pallor, restlessness, pain, and faintness.

Particular attention must be paid to the *pulse* in all cases in which the abdomen has been opened, as it is a most useful and accurate index of the patient's progress. If it remains steady, not much above the normal in frequency, the patient's condition may be regarded as satisfactory. Internal hæmorrhage will cause it to become more and more rapid and collapsible. With the onset of peritonitis, it will gradually increase in frequency, and diminish in size. Flatulence will sometimes cause it to become unsteady; but that is not necessarily a dangerous symptom unless at the same time its frequency is gradually increased. It should be carefully taken and recorded every hour during the first twenty-four hours, the temperature and respiration being taken every four hours.

The number of times the patient is sick and the character of the *vomit* must be noted; if retching is at all severe, the abdominal wound should be supported by the nurse's hand. The *urine* should be carefully measured for the first few days, as the patient may frequently pass small quantities, and yet from temporary paralysis of its walls the bladder may retain a considerable amount. In cases

of strangulated hernia or intestinal obstruction, the nurse must be prepared to say whether the patient has passed any *flatus* per anum.

As surgeons differ somewhat in their treatment of cases of abdominal section, the nurse should obtain precise instructions with regard to the feeding of the patient; how soon after the operation it is to be commenced, exactly what is to be given, and how often. She ought also to ascertain the surgeon's wishes with regard to the passing of a catheter, if the case is one in which this instrument seems likely to be required; also as to her course of action in the event of abdominal distension setting in, as evidenced by increasing tightness of the dressings and disappearance of the depression which normally exists at the pit of the stomach.

Beginning on the day after the operation the patient should be encouraged to move his feet and legs about. By doing so the circulation in the lower extremities is improved, and there will consequently be less wasting and also less risk of a blood-clot forming in a vein.

Technic of a Ward Dressing.—The nurse should follow as nearly as the different circumstances will allow the instructions laid down in connection with operations. Thus, she should turn up her sleeves, see that her nails are short and clean, and thoroughly wash her hands and forearms under running water. Then she should arrange her ward trolley, wiping with methylated spirit the shelf on which the instrument-tray and dressing drums are to go and covering it with a clean towel, sterile if available. The instruments required are boiled for three minutes, removed from the steriliser with sterile forceps, and placed in a sterile tray or porringer either dry or in sterile water or antiseptic solution. Next, she arranges the patient's clothes and bedclothes so that the dressing can be readily got at, and removes the bandage. She then scrubs her hands again, and soaks them in methylated spirit, or lysol or other antiseptic lotion, finally drying them with a sterile towel or leaving them wet. Sterile towels, taken from the

drum with clean forceps, are arranged around the wound, the soiled dressings are removed with forceps, which are then placed in a kidney-tray reserved for soiled instruments, while the dressings are dropped into an enamelled soiled-dressing pail. The wound is then cleaned with a swab, dried discharge being soaked off and pockets of pus emptied by gentle pressure. The skin around is also cleaned with sterile water and swabs, working from the wound. Some surgeons avoid water and clean with methylated spirit, or paint the wound and its neighbourhood with weak tincture of iodine. Clean gauze and absorbent wool, which has been sterilised in drums in thin layers of suitable size, are then placed on the wound with sterile forceps, a thin layer of non-absorbent brown wool is added to prevent any discharge soaking through and soiling the bandage, and the bandage is then applied. In septic cases the nurse should use rubber gloves, repaired ones being often reserved for this purpose. If a drainage tube is to be changed, a sterile duplicate one should be prepared, in order to avoid the delay entailed in cleaning and sterilising the one removed.

Cutting of Dressings.—A sterile towel should be spread on the table on which the dressings are to be cut. The hands should be thoroughly washed in running water, and all aseptic precautions taken. Tailor's scissors should be used, as cutting wool rapidly blunts ordinary scissors. The gauze and wool should be cut into pieces of useful size, not larger than necessary, as it is important to avoid waste. The wool should be in moderately thin layers, for two or more layers can be applied if required. If the drum is large enough the pieces should not be folded, for it is often inconvenient to have to unfold a dressing when applying it.

CHAPTER XXXI.

COMMON SURGICAL DISEASES AND OPERATIONS.

1. **Appendicitis** (p. 278).—The operation of *appendicectomy*, or removal of the appendix, may be done in the quiescent period—*i.e.*, for chronic appendicitis or after an acute attack has subsided. No drainage is required, and the patient gets up after about ten days. On the other hand, it may be done as an emergency operation in an acute case. No preparation of the patient is then possible save shaving and sterilising the skin of the abdomen. The urine should be tested for acetone and diacetic acid (see p. 111). No aperient or enema should be given unless ordered. If the peritoneum is infected, the surgeon usually inserts a drain of rubber tubing or protective with a gauze wick.

After-treatment.—As soon as the patient comes round from the anæsthetic, he should be propped up in the semi-sitting position. An enema may be given on the day after the operation, and calomel on the next day, followed by Epsom salts. The drain is removed after three or four days, and reinserted after cleaning, being shortened daily to allow the wound to heal from the bottom. Where drainage has been adopted, an abdominal belt is often advisable for three months.

Complications.—The operation may be followed by peritonitis, or secondary abscesses may result from the pus pocketing in the depths of the wound. The wound in the abdominal wall also may become infected. Fæcal fistulæ sometimes occur, but usually close eventually without

further operation. The scar may be weak, and hernial protrusion may result. Adhesions may follow the local inflammation, and these occasionally produce pain and even intestinal obstruction. Right-sided pleurisy and empyema may occur after an appendix abscess.

2. **Acute Peritonitis.**—See p. 284.

3. **Ulcer of the Stomach and Duodenum**—The *symptoms* and *medical treatment* were described on p. 276. Operative interference is indicated when a chronic ulcer resists medical treatment, or gives rise to hæmorrhage; when pyloric obstruction hinders the passage of food; and, urgently, when perforation occurs.

Operation for Chronic Ulcer.—By the operation of gastro-enterostomy a new opening may be formed between the stomach and the duodenum (*gastro-duodenostomy*) or the jejunum (*gastro-jejunostomy*). It is advisable that for some time before the operation stimulating articles of diet—*e.g.*, soups, butcher's meat, salt, &c.—should be avoided, only milk, bread, eggs, fish, and the like being taken. If the stomach is dilated, it should be washed out at intervals with sodium bicarbonate solution. The mouth and teeth should be got into good condition, and the bowels thoroughly emptied. At the operation many surgeons use special clamps for holding the stomach and intestine together during the stitching. When the patient has recovered from the shock he should be propped up in bed, and subsequently the diet should be carefully regulated in the manner detailed below.

Operation for Perforation.—An ulcer may perforate into the general peritoneal cavity, a most serious condition, or into the lesser sac of the peritoneum, or into a mass of adhesions. Sometimes only gas and mucus escape, sometimes food also. Fluid is then rapidly poured out from the peritoneum, and collects in the pelvis. The patient has severe pain, and is profoundly collapsed for several hours, improving later but eventually developing grave symptoms of peritonitis. Neither food nor morphine should be given until the diagnosis is definite. The surgeon opens the abdomen, sews up the perforation, and cleanses the

peritoneal cavity, draining it through an opening above the pubes. The skin has usually to be prepared on the table. After operation, the patient is propped up as early as possible, saline solution is given by rectum, and after a few hours a little water by mouth.

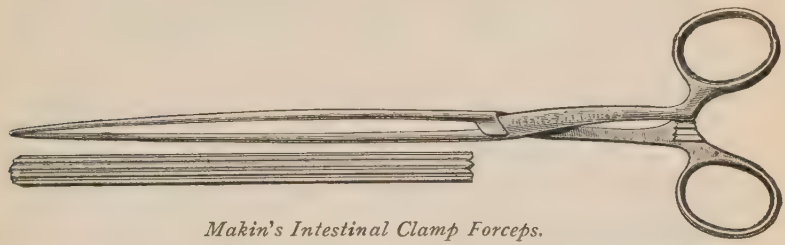
The *after-treatment* of gastric cases is thus shortly described by Gray. *Diet:* If no sickness, give dessert-spoonfuls of tepid sterile water every hour after operation. Next day double the quantity, and add Somatose or Plasmon; albumen-water (whites of four or five eggs to 1 pint of water). Third day, 1 oz. every two hours of milk and soda, thin Benger's food, chicken tea, or weak tea. Fourth day, 2 oz. every two hours. Fifth day, 3 oz. every two hours. Sixth day, 4 oz. every two to three hours. Seventh day, 4 oz. every two to three hours; milk pudding, chicken cream, pounded sweetbread, &c., sponge finger biscuits. Eighth day onwards, gradual progress through light to easily masticated ordinary food by fourteenth day. *Saline infusion:* Rectal—continuously, or 10 to 20 oz. every three to four hours—for first two to three days; gradually decrease as the amount by mouth increases. *Bowels:* Enema on third day, and every second day thereafter until aperients are given by mouth on fourth to seventh day.

Complications.—Bleeding, giving rise to pain and hæmatemesis, may occur during the first two days after operation. No food should then be given by mouth, and morphine should be injected hypodermically. In debilitated patients pneumonia may be a sequel to operation, hence the importance of nursing them in the semi-sitting position.

Following gastro-enterostomy "regurgitant vomiting" may occur, owing to a kink at the site of union. If this happens the patient should be placed in Fowler's position, the stomach washed out, and rectal salines administered, nothing being given by mouth; if this does not give relief, further operation is required. Intestinal obstruction also may sometimes result from a piece of intestine being strangulated by the loop formed by the jejunum.

4. **Stricture of the Œsophagus.**—This was described

on p. 275. It is treated by early *gastrostomy*, which consists in making a permanent opening into the stomach through the abdominal wall and inserting a tube through which the patient can be fed. Five ounces of warm beef-tea or peptonised milk should be ready at the operation in order that the patient may be fed at once if the surgeon considers it advisable. In the after-nursing special attention should be paid to the mouth, as the patient often suffers from thirst and dryness. Owing to his enfeebled condition it is generally necessary to commence feeding early. About four hours after the operation, a funnel having been connected with the tube, 4 oz. of milk should be administered; this should be repeated four-hourly, and the amount gradually increased to half a pint with one or

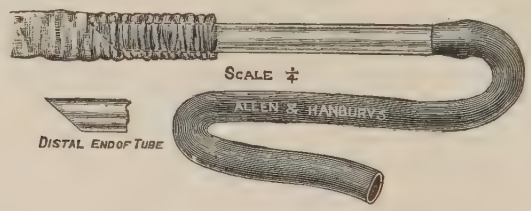


Makin's Intestinal Clamp Forceps.

two eggs added. On the third day the wound is generally dressed, and after a week the tube may be removed, cleaned, and replaced. The skin around may be smeared with sterilised vaseline to protect it from the irritating gastric juice which may escape. After a month the tube is usually left out at night.

5. **Rupture of Stomach or Intestine by Violence.**—The *stomach* may be ruptured by blows or falls on the epigastrium, especially after a heavy meal. The symptoms are prolonged shock, with epigastric pain and vomiting, often blood-stained; peritonitis rapidly ensues. The abdomen is opened (*laparotomy*); all extravasated material is sponged away, the wound in the stomach sutured, and a drain inserted in the abdominal wound.

Rupture of the *intestines* may result from the patient being tightly squeezed, or from a vehicle passing over the abdomen. The symptoms are severe shock, accompanied by intense abdominal pain. Almost acute peritonitis



Moynihan's Intestinal Drainage Tube.

occurs, and the patient rapidly succumbs. Treatment consists in opening the abdomen and sewing up the tear. Intravenous saline injections are often required before this can be done.

6. **Intestinal Obstruction.**—The *causes* and *symptoms* are enumerated on p. 280. In acute obstruction the abdomen is opened and the cause dealt with. If the bowel is so damaged that it will probably not recover, *enterectomy* is done —*i.e.*, the affected piece is excised and the cut ends sutured together. If the patient is too collapsed for this, *enterostomy* is done as a temporary measure, the bowel being opened above the obstruction and emptied of its contents by means of a Moynihan's tube, to which a rubber tube is attached to convey the material to a receptacle.



Paul's Intestinal Drainage Tube.

Colostomy is usually performed for cancer of the colon or rectum; a temporary opening may be made as a preliminary to excision, or a permanent one to relieve obstruc-

tion in inoperable cases. In the former case, the colon is merely sewn to the abdominal wall and opened; in the latter, a loop is drawn out and prevented from retracting by passing a glass rod through a hole in the mesentery. On the third day the loop is opened, and a Paul's tube is tied in and connected with a large rubber tube leading to a receptacle at the side of the bed containing some antiseptic. On the seventh day the glass tube is removed; on the eighth day the protruding bowel is cut away with scissors flush with the skin, bleeding being arrested by cautery or ligature. An effective barrier or "spur" is thus formed between the two parts of the bowel.

After-treatment, apart from the above, consists in giving castor oil and keeping to a fluid diet until the colostomy acts well. The stitches may be removed on the eighth day, or earlier if cutting through. The skin should be protected by an ointment dressing. The bowel below the opening should be washed out from above downwards two or three times a week. After a month a colostomy cup and belt may be worn. In the case of a right-sided colostomy the cup must be replaced by a receptacle, as the fæces are fluid.

Complications.—Small intestine may escape, owing to the strain of vomiting, and give rise to signs of intestinal obstruction; the surgeon will clean the intestine, return it to the abdomen, and re-suture the wound. Sometimes the intestinal wall is paralysed in acute obstruction, and the bowels refuse to act; purgatives are given. Peritonitis also may occur. The colostomy opening may contract and require dilating, or the mucous membrane may protrude, forming a moist bleeding mass.

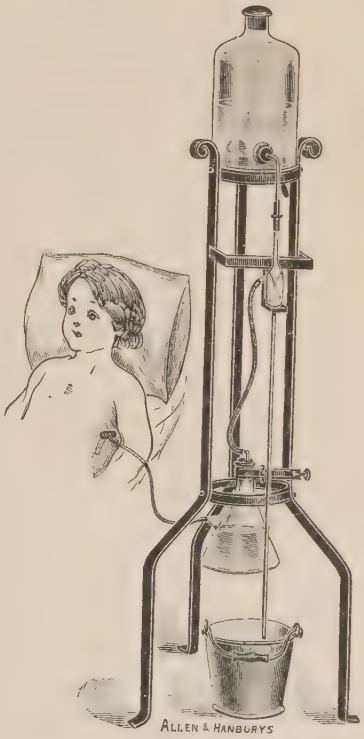
7. **Congenital Pyloric Stenosis.**—*Rammstedt's operation* is usually done: it consists in dividing the hypertrophied muscular wall of the pylorus. The stomach is washed out one hour before operation. Gas and oxygen anæsthesia is often employed, and fluid may be given subcutaneously both before and during the operation. After operation the child must be kept warm. The *feeding*

consists in giving hourly 1 drachm feeds of breast milk, or of peptonised milk diluted with an equal quantity of water, commencing six hours after the operation. At the end of twelve hours after operation, the amount is increased to 1½ drachms hourly, and eighteen hours after operation 2 drachms are given every hour and a half. The amounts are gradually increased so that, twenty-four hours after the operation, the child is getting 4 drachms every two hours. If there is an adequate supply of breast milk, the infant should be allowed to nurse at the breast three-hourly from this time onwards. If not breast-fed, the amount is increased so that, thirty-six hours after operation, the feed is 2 oz. every three hours; and by forty-eight hours after the operation the feed given is almost the full amount for its weight. Those infants who are breast-fed recover in a much larger proportion of cases than those artificially fed.

8. **Empyema of Thorax.**—This condition was described on p. 264.

A purulent pleural effusion requires urgent operation. The simple operation of removal of a piece of rib with insertion of a drainage tube into the pleural cavity is now less often done than formerly, as it is apt to result in secondary infection, followed by a sinus which heals but slowly, and by some permanent collapse of the lung. Continuous aspiration is sometimes used; or the pleural cavity is opened through an intercostal space, the lymph removed, and the wound sewn up after irrigation. Sometimes "valvular" drainage is employed, so that pus may escape without air being sucked in; a piece of rib is removed, and the pus and lymph cleared out by saline irrigation; a drainage tube is then inserted into the pleural cavity and stitched in the wound, which is otherwise completely closed, the other end of the tube leading into a vessel containing antiseptic solution and placed underneath the bed. The *special instruments* required are a periosteum elevator, a Doyen's rib raspatory or an aneurism needle (for clearing the periosteum from the inner surface of the rib), and rib-cutting forceps, with a drainage tube and safety-pin.

After-treatment.—The dressing should be renewed as often as necessary and the tube changed on the third day; to save time two tubes may be available. Care should be taken not to infect the wound more than it already is infected, and the drainage tube should be secured by means of a piece of silk or a safety-pin, otherwise it may disappear within the thoracic cavity. Free drainage having been established, it is necessary to restore full expansion to the lung. This may be assisted by getting the patient to blow water from one bottle to another through glass tubes, or to distend a football bladder. If the lung does not expand, and the sinus persists, removal of pieces of several ribs (*thoracoplasty*) may be necessary to enable the chest wall to fall in. Lateral curvature of the spine may result from empyema.



Treatment of Empyema by Reynolds' Trocar and White's Suction Pump.

9. **Acute Mastoiditis.**—The mastoid bone is often involved in inflammation of the middle ear. This gives rise to redness, swelling, pain, and tenderness behind the pinna. It is dangerous owing to the proximity of the brain and its membranes, and of the lateral sinus, which may become thrombosed.

In young children, a simple incision through the perios-

teum (*Wilde's operation*) may be sufficient. In many cases drainage of the antrum, which is close behind the middle ear and communicates with it, is needed. The operation takes the form of opening the antrum, and either (*a*) allowing it to granulate up (*Schwartze's operation*), or (*b*) making it form part of the posterior wall of the external auditory canal (*Heath's operation*), or (*c*) making it form one cavity with the middle ear, removing the ossicles at the same time (*the radical operation*). The hair should be shaved around the mastoid region, as little as possible being removed in women. The ear should be thoroughly cleansed with hydrogen peroxide drops, followed by careful mopping with gauze. The *special instruments* used are a periosteum elevator, gouges, a mallet, Stacke's protector (to protect the facial nerve), and fine probes and scoops.

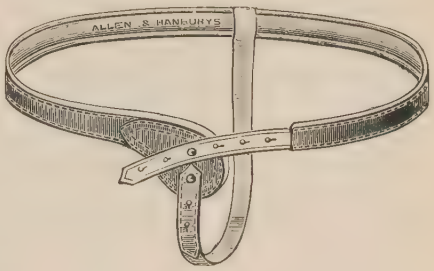
The *after-treatment* of these cases lasts for several weeks, or even months. The early dressings will probably be done by the surgeon, and the nurse should provide a lamp and forehead mirror, aural speculum, forceps, probe, syringe, and swabs. At first the dressing may be done on alternate days, but later a daily one is needed owing to the increasing discharge. The tube or gauze plugging should be kept in while the wound heals from the bottom, and usually steps have to be taken to prevent an overgrowth of granulation tissue.

Complications are paralysis of the facial nerve, meningitis, abscess of the brain, and thrombosis of the lateral sinus.

10. **Hernia.**—The usual positions for a hernia—*i.e.*, a protrusion of the bowel or omentum through the abdominal wall—are in the groin and at the umbilicus. The latter is known as an *umbilical* hernia, the former as either an *inguinal* or a *femoral* hernia according to whether it occupies the inguinal or femoral canal. The hernia is termed *reducible* if it can be returned to the abdomen by manipulation ; if it cannot, it is said to be *irreducible*. If an inguinal or a femoral hernia is irreducible it should be operated on, lest strangulation (see below) occur.

An umbilical hernia in an infant can usually be cured by a belt, or a pad fixed on by strapping, provided the pro-

trusion is not allowed to occur for some months. Operation is successful in nearly all cases of inguinal hernia in the young, and trusses are not so much used as formerly. The operation consists in exposing the sac of peritoneum into which the hernia protrudes, tying it off as close as possible to the general peritoneal cavity, and restoring the tendinous walls of the canal again by suture.



Single Truss for Inguinal Hernia.

After-treatment.—The patient should lie on his back with a pillow under the knees to relax the abdominal muscles. In young children, a thin layer of brown wool or a piece of jaconet should be wrapped round the dressings with a couple of turns of bandage to keep them dry, a hole being cut for the penis in the case of boys. If the bowels do not act by the third day an aperient should be administered, after which ordinary diet may be given. The dressing is not disturbed until the eighth day, when the stitches are removed. The patient should rest in bed for two or three weeks.



Hernia Director.

Complications.—Retention of urine may occur in males; fomentations to the lower abdomen should be tried, and the patient allowed to turn on his side; occasionally catheterisation becomes necessary. Vomiting is sometimes persistent and troublesome. Recurrence of hernia is uncommon.

11. **Strangulated Hernia.**—If the bowel or omentum

forming a hernia is constricted at the hernial orifice to the extent of having its circulation interfered with, it is said to be strangulated. The bowel is obstructed, the loop may become gangrenous, and peritonitis may occur. Operation is urgent; no enema or purgative should be given, but the stomach may require washing out, and the necessary apparatus should be at hand. The *special instruments* required are a hernia director, a hernia knife, and hernia needles in handles, right and left. The stricture constricting the loop is divided, and the bowel drawn down and examined. If the patient is fit, a *radical cure* is done. If the bowel is gangrenous, *enterectomy* is necessary, but should the patient be too ill the loop may be brought to the surface and opened above the gangrenous spot, an operation being done later to remedy the condition if the patient survives.



Hernia Bistoury.

After-treatment.—If vomiting continues the stomach should be washed out, especially if the vomit is fæcal. Otherwise the management of the case does not differ from that indicated for herniotomy.

Complications.—Peritonitis or distension of the intestines may follow the operation.

12. **Hæmorrhoids,** or *piles*, may be either external or internal to the anus. An external pile is a hypertrophied tag of skin, or a dilated vein covered with skin; an internal pile consists of a number of dilated veins covered with mucous membrane. External piles may become inflamed and suppurate; internal piles produce hæmorrhage during and after defæcation, in which action they are often protruded, with the result that the patient suffers considerable pain until they are returned to the bowel.

Treatment consists in relieving the cause—*e.g.*, attending

to a torpid liver or chronic constipation, avoiding alcohol, and applying soothing and astringent ointments. If this fails, operation may become necessary, either ligation, excision, use of clamp and cautery, or removal of the pile-bearing area (Whitehead's operation).

Operations are also performed for **Rectal Cancer, Fistula,** and **Fissure.** They all require special *preparation* owing to it being impossible to render the part aseptic, and difficult to control the passage of fæces. The bowels may be thoroughly emptied by castor-oil given thirty-six hours before the operation, and the rectum washed out by a large soap-and-water enema in the early morning and with a saline enema three hours before the operation (or see p. 515). The skin around the anus should be shaved if necessary, and well washed with soap and water. A T-bandage, made out of a calico rib-roller, may be tied round the patient's waist before the operation, to be used later in supporting the dressing. A morphine suppository and a rubber tube packed round with gauze are often introduced into the rectum before the patient leaves the table.

After-treatment.—The patient should be kept lying down, so as not to disturb the wound. Retention of urine is common, and should be treated as already described. Hæmorrhage is not rare, and generally does not show externally, the bleeding taking place into the rectum. This concealed hæmorrhage should be carefully looked for; suggestive symptoms are restlessness, thirst, and pallor, with a rising pulse and a desire to pass a motion, and the occurrence of these symptoms should be at once reported to the surgeon. Some surgeons, as already mentioned, leave a tube in the rectum to allow of the escape of gas; in these cases hæmorrhage is more readily recognised. A few ounces of olive-oil are given through the tube on the fifth day, after which it is removed. Until this is done the bowels are kept unopened and pain is relieved by giving opium (*e.g.*, Pil. Saponis Co. gr. 1); at the end of the fifth day an aperient may be given, and repeated each day. The food meanwhile should have been

limited, and such as to leave little residue. The part should be washed with antiseptic solution after each motion, and the wound redressed. In dressing a case of *fistula* care should be taken to pack the wound to its full depth with the gauze strip to ensure healing from the bottom. A daily bath preceding the dressing is beneficial.

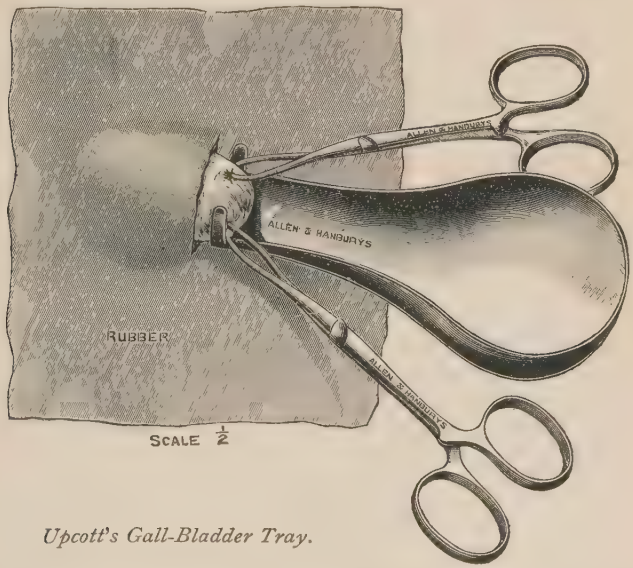
Complications.—Retention of urine, as already said, is common. Sepsis may follow the operation. Hæmorrhage may occur a few hours after the operation (reactionary), or near the end of the week when the ligatures cut through or sloughs separate (secondary). It must be remembered that the hæmorrhage may be all internal if there is no tube in the rectum. Reactionary hæmorrhage is treated by ligaturing the bleeding point under an anæsthetic. In secondary hæmorrhage a petticoated tube (made by passing a stout tube through a hole in a piece of linen and firmly tying this to it) is passed into the bowel for about three inches, and gauze is tightly packed into the space between the linen and the tube, thus exerting pressure on the bleeding part.

13. **Diseases of the Gall-Bladder.**—Diseases of the gall-bladder (p. 282) and of the bile-ducts (p. 283) have already been briefly described.

The principal operations include establishing an opening in the gall-bladder in order to drain the bile through the wound (*cholecystostomy*); removal of the gall-bladder for gall-stones or malignant disease (*cholecystectomy*); making a permanent opening between the gall-bladder and the duodenum, when the common bile-duct is blocked (*cholecyst-enterostomy*); opening the common bile-duct to remove a gall-stone and closing it again (*choledochotomy*); and draining the common bile-duct (*choledochostomy*). Since jaundice, which is often present, interferes with the coagulation of the blood (p. 488), there is a liability to post-operative hæmorrhage, and calcium chloride is therefore given for a few days before operation usually. Specimens of fæces and urine should be kept for the surgeon, in order that he may see whether any bile is entering the bowel,

and whether the urine contains bile. The *special instruments* required are gall-stone scoops and forceps.

After-treatment.—A peritoneal drain of rubber tubing with a gauze wick is usually inserted. If the gall-bladder is to be drained a long rubber tube, leading into a bottle placed in the bed to receive the bile, is inserted into it and stitched to the skin. The patient should early be placed in the semi-sitting position. In cholecystostomy



Upcott's Gall-Bladder Tray.

the peritoneal drain may be removed on the third day, and the bile tube at the end of a week. An enema should be given on the day following the operation, and calomel and salines on the next day. In choledochostomy, the bile tube is removed on the fifth day, but the peritoneal drain is generally retained for nearly a week longer.

Complications.—Hæmorrhage should be treated by pressure with a pad soaked in adrenalin. The risk of bronchopneumonia should be lessened by keeping the patient in

the semi-sitting position. A biliary fistula, due to blockage of the common bile-duct by a stone or adhesion, may require further operation; care should be taken that the skin is protected from bile by a thick ointment dressing, otherwise it will become sore. Hernia of the scar sometimes develops, and an abdominal support is therefore advisable for some months.

14. **Diseases of Genito-Urinary Organs.**—(*a*) **The Kidney** may be incised (*nephrotomy*); opened for the removal of a stone (*nephrolithotomy*); opened and drained (*nephrostomy*); excised for tuberculous or malignant disease, &c. (*nephrectomy*); or fixed if movable or floating (*nephrorrhaphy*). A urinary antiseptic, such as urotropine, should be given for several days before the operation, and the urine should be measured both before and after it. The *special instruments* required are renal calculus forceps, a long fine needle for probing for a stone, and a sand-bag or air-cushion to be placed under the loin.

After-treatment.—At first the patient should lie on his back, with pillows arranged under the shoulder and pelvis so as to prevent pressure on the wound; after a few hours he should be propped up. After vomiting has ceased, water, barley water, &c., should be given freely by mouth to induce flow of urine. The dressings should be changed as often as they are soaked. In cases of pyonephrosis or abscess of the kidney, the rubber tube and gauze inserted for drainage are changed daily, and the cavity irrigated. The patient may get up about the tenth day; except after nephrorrhaphy, after which he should lie for at least three weeks with the foot of the bed raised a few inches to relieve any strain on the sutures, and wear an abdominal support for six months longer.

Complications.—Bleeding may occur through the wound, or down the ureter. The passage of clots in the latter gives rise to symptoms of renal colic. Shock and retention of urine may occur. Suppression of the urine should be treated by saline injections into the rectum or under the skin. Uræmia may occur if the other kidney is diseased.

Renal colic is relieved by small doses of morphine, hot fomentations, and hot drinks. Flatulent distension of the abdomen, which is not uncommon, may be treated by a turpentine enema.

(*b*) **The Bladder** may be opened above the pubes (*suprapubic cystotomy*), or from the perineum (*perineal cystotomy*), for the treatment of stone, bladder tumours, enlarged prostrate, and cystitis. In these cases the urine is generally infected, and it is necessary to drain the bladder. A stone in the bladder is sometimes crushed by a lithotrite and the fragments removed by means of an evacuator (*litholapaxy*). The preparation is the same as for kidney operations; the urine is measured and tested daily; urinary antiseptics are administered throughout, and the bladder may be washed out for several days before operation.

In Suprapubic Cystotomy the patient, after being anæsthetised, is placed either in the dorsal or in the Trendelenburg position; the bladder is irrigated, and about 10 oz. of boric lotion left in it to raise it well above the pubes. In cases where the bladder is not sewn up, a drainage tube is fixed in by a purse-string suture so as to form a water-tight joint; this tube is connected by a glass junction to a long rubber tube, the end of which is placed in a urinal. *After-treatment.*—Pain is relieved by morphine and belladonna suppositories. If the dressings get wet they should be removed, the skin around the wound washed and dried, and an ointment thickly smeared on. Gauze and a thick layer of absorbent wool should then be applied, covered with a layer of non-absorbent brown wool to protect the bandage. The dressing should be changed two or three times daily in this way, and the back carefully attended to. The suprapubic tube is usually removed at the end of a week, and towards the middle of the second week urine is generally passed by urethra again, and the wound gradually closes up. If necessary a catheter is passed three times daily, the patient being kept dry by Irving's overflow apparatus. If the urine is alkaline when

passed, acid sodium phosphate or ammonium benzoate may be given, and, if there is cystitis, the bladder may be irrigated several times daily. *Complications.*—Retention or suppression of urine may occur, and pelvic cellulitis may result when the urine is very foul.

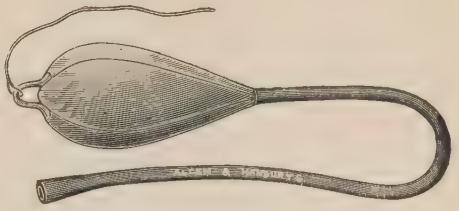
In *Perineal Cystotomy* the perineum is shaved and cleansed; at the operation the patient is placed in the lithotomy position. *After-treatment.*—Pain is controlled by morphine and belladonna suppositories. The dressings, held in position by a T-bandage, and also the draw-sheet, are changed every few hours; great care should be taken of the skin of thighs and buttocks. The drainage tube is usually removed during the first week, and the wound gradually closes. The bladder is irrigated twice daily. *Complications.*—Hæmorrhage may occur, and may be treated by the insertion of a "petticoated" tube. Pelvic cellulitis may set in, and sometimes the opening in the perineum may refuse to close for some time.

After *Lithotrity*, or *Litholapaxy*, the patient stays in bed ten days, a large catheter being kept in the bladder for thirty-six hours. He should turn on his side to pass water, or sit in a hot hip-bath and try to pass his water in it. Morphine suppositories may be necessary. Milk and barley water only should be given at first.

(*c*) **The Prostate.**—*Hypertrophy of the prostate*, the gland which surrounds the neck of the bladder at its junction with the urethra, is rarely met with in men under fifty. The early symptoms are difficulty in micturition, followed gradually by frequency caused by irritability of the bladder; eventually retention occurs. It is treated by regular passage of a sterile catheter, and avoidance of alcohol, cold, and damp. If these measures fail, prostatectomy (removal of the prostate) becomes necessary; it is usually done through a suprapubic incision into the bladder, the patient being in the Trendelenburg position and the bladder distended with fluid.

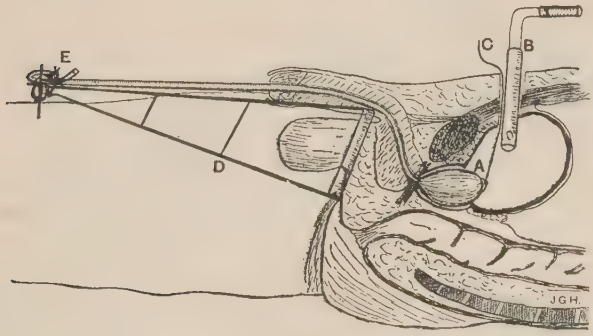
Several methods of *controlling hæmorrhage* are in use, and one may be briefly described. After the prostate has been

removed, a special sound with an olive tip is passed through the urethra and the tip made to appear in the incision. The tube connected with a hollow rubber Hagner's bag is affixed to the olive tip, and the sound is withdrawn, carrying the tube with it. By traction on the tube, the bag is drawn into the cavity left by the removal of the prostate; the bag is then inflated with air, and the end of the tube tied.



Hagner's Hæmostatic Bag.

All clot is removed from the bladder, and a large rubber tube, with a glass connection and tube leading to a collecting bottle, is inserted in the suprapubic opening.

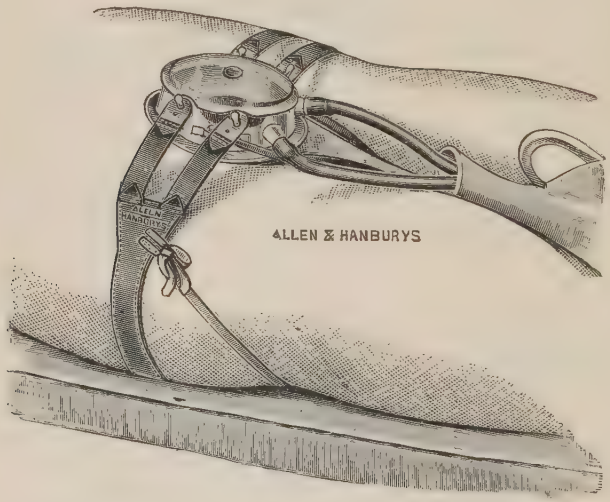


The prevention of hæmorrhage in Prostatectomy
(Basil Hood in 'The Lancet,' 1925).

Dressings are then applied, and the ends of the tube are tied to a tripod frame (Cabot's), the base of which rests on the perineum, a large pad of cotton-wool being placed within the frame to support the scrotum. After twenty-

four hours the air can be let out of the bag and the cage removed. A little later the drainage tube can be removed, and the bag withdrawn by means of the thread. Any small clots in the bladder can then be removed by injecting and aspirating boric lotion with a syringe.

Complications and *after-treatment*.—The chief anxieties are hæmorrhage, shock, uræmia with suppression of urine, sepsis, pulmonary complications, and embolism. The nurse should suspect hæmorrhage if the pulse becomes more



Irving's Suprapubic Apparatus, with celluloid cup.

rapid, or if there is an increasing amount of blood coming away through the drainage tube or the dressings. It may then become necessary to wash out the bladder with hot lotion, or reopen and pack under an anæsthetic. Shock is dealt with in the ordinary way. Hypostatic congestion is avoided by propping the patient up and changing his position at intervals, and by light massage. Water should be given freely once the post-anæsthetic vomiting is over. For the first day or two the dressings are allowed to soak

up the fluid, the nurse changing the outer dressings as often as is necessary. Then an Irving's box is applied, and the bladder is washed out daily, the tube being removed on the third day. The bowels are opened with castor-oil on the second or third day. Urine is usually passed naturally at the end of the second week, the wound healing during the fourth week.

(*d*) **Circumcision** is required for *phimosis* (narrowing of the orifice of the prepuce or foreskin sufficient to prevent the latter from being retracted over the glans). *Paraphimosis* is the name given to the condition which arises when a child retracts the foreskin and is unable to restore it, œdema of the penis resulting. The surgeon diminishes the œdema by firm pressure, and then draws the swollen prepuce over the glans; later, circumcision is generally advisable. *Operation.*—Under an anæsthetic the foreskin is drawn well forward and held between Kocher's forceps. It is then cut away, and the mucous membrane slit up and trimmed, leaving about $\frac{1}{4}$ in. around the glans. Vessels are tied with catgut, and a few catgut stitches inserted to unite skin and mucous membrane. The dressing should be light and simple. A piece of lint soaked in lead lotion, or a narrow bandage of sterile gauze soaked in hydrogen peroxide, or sterile gauze smeared with hazeline ointment, may be used, wrapping them round as if bandaging and securing them to the abdomen by a strip of plaster. Or a large pad of brown wool, with a hole in it to admit the penis, may be fixed on by taking a few turns of bandage round the body and thighs. The mother is instructed to keep the lint moist with the lotion. The patient should be kept in bed for forty-eight hours. Adults are usually given bromides at night. A dressing which becomes adherent may be soaked off in a hot bath.

Complications.—Slight hæmorrhage is often stopped by the lead lotion dressing. If more severe, it may produce a hæmatoma. It may be necessary to open up the wound and tie the bleeding point, or pass a stitch under the vessel and tie over it. If swelling and sepsis occur, the bath

should be used twice daily. Occasionally a painful shallow circular ulcer may develop around the meatus, due to slight abrasion of the delicate surface resulting from absence of the protecting prepuce. Ointment should be applied. Contraction of the foreskin may occur if insufficient mucous membrane has been removed.

(*e*) **Radical Cure of Hydrocele.**—A *Hydrocele* is a collection of lymph in the tunica vaginalis, the serous covering of the testicle. It is treated by tapping with trocar and cannula, or by excision. After excision, the drainage tube is removed in twenty-four hours and the wound sealed with collodion, pressure being maintained by wool and bandage, and the scrotum being kept well up on to the pubes to prevent serum collecting in it. This is assisted by placing a small cushion between the legs to support it. The patient is kept in bed a fortnight, and wears a suspensory bandage for some months.

(*f*) **Radical cure of Varicocele.**—A *Varicocele* is a dilated condition of the veins of the spermatic cord. A portion of the veins is tied off and removed. The after-treatment is the same as after hydrocele, as regards staying in bed and the use of the cushion and suspensory bandage.

15. **Cancer of the Tongue** is a frequent and very fatal variety of this disease. It usually occurs in men over forty-five years of age, and in some cases appears to be induced by excessive smoking or the irritation of ragged teeth. It leads to the formation of a painful ulcer at the side or base, with fixity of the organ, and early enlargement of the neighbouring lymphatic glands.

The operation of removal, which may involve the whole or only part of the tongue, is usually accompanied or followed by removal of the infected glands of the neck. The teeth should be attended to in advance, and every effort made to purify the mouth by antiseptic mouth-washes, &c. The hair of the lower part of the face should be removed. Laryngotomy may be needed, and the anæsthetic is sometimes administered intratracheally. The *special instruments* required are a gag and blunt-pointed scissors,

an aneurism needle if the lingual artery is to be tied as a preliminary, and the laryngotomy instruments.

After-treatment.—The patient should be propped up as soon as he has recovered from the anæsthetic. He should drink out of a feeder with a rubber tube attached, or nasal feeding may be used if necessary. The mouth will need frequent irrigation, swabbing, or spraying, especially before and after food. As talking is difficult, a writing tablet and pencil should be provided.

Complications.—Hæmorrhage may occur, usually at the end of a week, from sloughing of the stump; it may generally be controlled by making the patient sit up, and hooking the stump forward to compress the vessels against the lower jaw. Œdema of the larynx, which may require tracheotomy, sometimes happens; or the patient may be asphyxiated by the stump falling back, to prevent which a silk suture is often passed through the base of the tongue and left hanging out of the mouth. Septic pneumonia may result from blood, discharge, or food being sucked into the trachea, and is the common cause of death; the mouth should be kept as clean as possible and the patient should be placed well over on his side to prevent this.

16. **Hare-lip,** which is described on p. 379, is operated on when the child is two or three months old.

After-treatment.—Strips of folded paper should be wound round the arms and fixed with a bandage *under* the clothes to prevent the infant touching the wound. Attention should be paid to the limitation of crying. The liquid food should be given with the point of a small spoon, which should not be allowed to touch the upper lip. If a collodion dressing has been applied, it should not be changed until the tension stitches are removed on the third day; the remaining stitches may be left in a week or more.

Complications.—The sutures may become septic and the wound break down; they should be removed if this occurs, and strapping applied to approximate the edges. Sometimes during the first few hours the lower lip gets sucked in and, by obstructing respiration, gives rise to suffoca-

tion; this may be prevented by gently pressing the lower lip downwards.

17. **Cleft Palate,** described on p. 380, is operated on between the ages of two and six years, by separating flaps from the roof of the mouth, paring the edges of the cleft, and sewing them together. The *special instruments* required are a Junker's inhaler, a gag, fine knives and needles in handles, right and left, raspatory, and toothed forceps. The sutures, which may be silk, horsehair, or silver-wire, are removed at the end of a fortnight.

After-treatment.—The child should be placed so that the saliva, &c., can dribble readily from his mouth. For the first few days he should be fed with a spoon, nothing being allowed but cold fluids. The spoon should not be put into the mouth, but its tip placed on the incisor teeth, and the handle raised so as to empty its contents on the tongue. He must not be allowed to speak, or, if possible, cry; nor should the mouth be opened by any one except the surgeon, for the purpose of examining the wound. This should be irrigated three or four times a day, and the mouth washed out after each meal. No food requiring mastication should be given for three weeks. The stitches generally ulcerate their way out, but may require removal under an anæsthetic. Breathing exercises and voice-training are essential afterwards. If the operation fails, an "obturator" may be made by a dental surgeon.

Complications.—Bleeding can generally be arrested by pressure against the palate with a gauze pad. Sepsis may cause the wound to break down.

18. **The Skull.**—In *craniectomy* a large scalp flap is turned back, the skull is trephined, and the opening enlarged by removing the bone. In *craniotomy* the flap includes both scalp and bone, the latter being replaced at the end of the operation. The operation is required in cases of depressed fracture of the skull, in abscess of the brain or hæmorrhage on its surface, and for the removal of a cerebral tumour or to relieve tension (decompression) if it is irremovable. The scalp is usually shaved the day before,

care being taken not to produce abrasions which may become septic; it is then well washed with hot water and soap, and any grease is removed by ether. At the operation the patient may lie with the head of the table raised to an angle, or a special head-rest may be used.

After-treatment.—The patient should lie with the head slightly raised, and the bed should not face the light. Perfect quietness is essential. He should have liquid diet, a nasal tube being used if he is unconscious. No stimulating drink should be given. The bowels should be kept freely opened. The nurse should watch for and report escape of cerebro-spinal fluid, impairment of consciousness, twitching, paralysis, delirium, unequal pupils, slowing of the pulse and respiration, Cheyne-Stokes breathing, retention of urine, total incontinence, persistent vomiting, and bed-sores, which are *complications* liable to occur. *Hernia cerebri* is a protrusion of œdematous tissue through the opening in the skull, and is usually the result of sepsis; it should be dressed aseptically.

19. **The Spine.**—*Laminectomy* consists in resection of one or more vertebral arches for fracture, dislocation, or inflammatory disease of the vertebræ or meninges, causing pressure on the spinal cord. At the operation the patient lies on his face, with sand-bags arranged under the pelvis, upper part of the chest, and the forehead, to avoid pressure which would interfere with respiration. In cases of spinal caries it is usual to make plaster casings of the whole body, one for the front and one for the back; these allow the patient to be lifted and turned without risk of displacing the vertebræ or graft, if one has been inserted.

After-treatment.—Care must be taken to avoid bed-sores. Pain may require treatment, as it is often severe. Retention of urine is not uncommon, and may necessitate catheterisation. *Complications* are shock and escape of cerebro-spinal fluid; the latter should be treated by raising the foot of the bed.

20. **Excision of Joints.**—The strictest aseptic precautions are necessary. In the upper limb it is desirable if

possible to obtain a movable joint; in the lower limb ankylosis in good position is generally aimed at. In the latter case any movement of the bones must be avoided for many weeks, and a leather or celluloid splint should be worn for at least a year; in the case of children it should be retained for several years, as there is a tendency to the occurrence of deformity. If a movable joint is desired, active and passive movements and massage should be started as soon as the wound is sound, generally towards the end of the second week. At the end of the third week it is often possible to have the splint off during the day, and let the arm be supported in a sling.

21. **Amputation.**—This may be done by dividing through a joint (*disarticulation*), or by cutting through a bone. It is called for when the limb is disorganised by disease, gangrenous, or badly injured.

After-treatment.—The stump is supported by Gooch splinting, padded and shaped, straps and buckles, and the bed made as described on p. 71. At first frequent inspection is advisable lest hæmorrhage occur. Shock may be present and require treatment. Spasm of the muscles is relieved by morphine, and the application of a very hot rubber bottle to the outside of the bandages. When the stitches are removed, the edges of the flaps should be drawn together with strapping, and the stump bandaged from above down. An artificial limb should be supplied at an early date.

Complications.—Hæmorrhage (reactionary or secondary); pain; sepsis; persistent sinus (often due to a deep stitch or dead bone); adherent scar (which should be prevented by gently moving the scar on the deep tissues daily after the wound has healed); and conical stump (especially liable to occur in children).

22. **Thyroidectomy** is the removal of the thyroid for growth, goitre, or exophthalmic goitre. Tracheotomy instruments and sand-bags are needed; light gas-oxygen-ether anæsthesia is generally used.

After-treatment.—The head must be kept steady to allow

the wound to heal, and the dressing must be protected from soiling.

Complications.—Hæmorrhage and sepsis, or cellulitis of the neck, may occur. Aphonia may be caused by injury to the recurrent laryngeal nerve. "Thyroidism" may come on after twenty-four or forty-eight hours, giving rise to pyrexia with a bounding and rapid pulse. It usually subsides, but the wound may require opening, washing out, and drainage to prevent further absorption of the secretion of the gland. For prevention, rectal salines soon after completion of operation are recommended. Tetany (tonic flexion of muscles of hands) may develop if the parathyroid glands have been removed; it is treated by giving parathyroid extract by mouth.

23. **Removal of Cervical Lymphatic Glands.**—The head is placed on a pillow, and the face turned towards the opposite side; the glands are removed by dissection; the skin is brought together with clips or stitches, a drain often being inserted.

After-treatment.—Care should be taken that the dressing is not soiled by vomit, the patient being turned on his side so that the strain of vomiting does not cause bleeding or pull on the stitches. He should be prevented as far as possible from moving his head, sand-bags being used if the wound is large. The tube, if any, is removed in twenty-four hours. To avoid an unsightly scar, the stitches too are often removed early, and the edges of the wound supported by strips of adhesive plaster. Fresh air and good food are essential.

Complications.—Hæmorrhage and sepsis may occur. Nerves or vessels may be injured during the operation. Recurrence of the disease is not infrequent.

24. **Varicose Veins.**—This is a condition in which the veins become dilated and tortuous; it is common in the legs, spermatic cord (*varicocele*), and lower rectum (*hæmorrhoids*). In the legs, varicose eczema and ulcer may result. The vein may become inflamed (*phlebitis*), giving rise sometimes to embolism. Death may occur from rupture of the

vein, unless the limb is raised and pressure exerted on the bleeding point. The bowels should be kept freely open, an elastic stocking worn, and prolonged standing avoided. If still giving trouble, the dilated veins are ligatured or removed.

After-treatment.—The limb should be raised on splint or cushion, or by slinging from a cradle. The dressings are not changed for a fortnight. When they are removed, the wound edges are drawn together with strapping, the leg powdered, and a domette bandage applied from the toes. The patient should stay in bed at least three weeks, and an elastic stocking or Velpeau bandage should be worn for six months.

Complications.—Gaping of the wound after stitch removal, and sloughing of skin edges may occur. Œdema of leg on first getting up can be prevented by careful bandaging.

25. **Amputation of the Breast.**—This is required for *cancer,* the commonest form of which in the breast being called scirrhus. The axillary lymphatic glands become enlarged and require removal, together with the lymphatics leading to them, and the greater part of the skin over, and the fascia under, the breast. Early diagnosis, on which early operation depends, is essential for the best results. *Non-malignant affections* producing local enlargement are mastitis (acute or chronic inflammation of one or more lobes), localised chronic abscess (sometimes tuberculous), cyst (often due to obstruction of the ducts or lobules), adenoma (the most common mammary tumour met with in women under thirty). An uncommon malignant breast tumour is sarcoma. The only advice that a nurse should give a woman who complains of a lump in the breast is that she should consult her doctor without delay.

Operation.—The cleansing should include neck, shoulder, arm, chest, and back, as well as the immediate site of operation. During operation the arm is held, wrapped in a sterile towel, abducted to a little beyond the right angle. A drainage tube is placed in the axilla, and a large dressing applied, with pads of wool in the axilla and behind, covered

with non-absorbent wool, to prevent oozing soiling the bandage.

After-treatment.—The patient should be propped up as soon as she has recovered from the anæsthetic, to avoid broncho-pneumonia. The arm is usually bandaged in the abducted position, and the patient has the elbow flexed and the forearm resting on a pillow. If oozing through the dressing occurs, more wool should be packed on. After two days the tube is removed and the wound dressed. On the fifth day the patient may sit in a chair for a short time. The stitches are removed on the tenth day. After the twelfth day the patient should practise movements of the shoulder. After three weeks the scar may be massaged to prevent adhesion to the deeper tissues.

Complications.—Sloughing may occur if there is great tension on the stitches owing to removal of much skin. Lung complications may occur. The wound may become septic. Œdema of the arm may result from obstruction of the lymphatics or thrombosis of the axillary vein.

26. **Operations on Tendons.**—*Tenotomy* is the division of a tendon (or the *plantar fascia*) through an open or subcutaneous wound to remedy a deformity, such as torticollis or talipes. The tendons most commonly divided are the tendo Achillis, tibials, peronei, inner hamstrings, and sternomastoid. For the subcutaneous operation, small narrow-bladed knives (tenotomes) are necessary ; usually a sharp-pointed one suffices, but a probe-pointed one is sometimes useful. Strict attention to asepsis is desirable. A plaster of paris case is usually applied.

Tendon-lengthening, usually of the tendo Achillis or hamstrings, is done by open operation, the split tendon being sutured with chromicised catgut, silk, or silkworm gut, a curved needle and needle-holder being used. The same are required for *tendon-shortening* and *tendon-transplantation* (tenoplasty). The latter is undertaken to fortify a weakened group of muscles, the strong transplanted tendon being sutured to the bone near the insertion of the paralysed muscle, or to its tendon.

CHAPTER XXXII.

ORTHOPÆDIC SURGERY.

I. Fractures.

Causation.—Fractures may be caused by *direct* or *indirect* violence. In the former case the bone is broken at the point upon which the blow falls; in the latter, the force of the blow is transmitted through a bone: thus the clavicle may be broken by a fall on the hands, and the base of the skull by a drop from a height on to the feet. Fracture by direct violence is naturally attended by more injury to the soft parts than is the case in the majority of indirect fractures.

A bone may also be broken by the sudden contraction of powerful muscles. In this way the knee-cap is fractured when an individual slips and, to prevent himself falling, suddenly contracts the muscles of the thigh.

Varieties of Fracture.—Fractures may primarily be divided into simple and compound.

In a *simple* fracture there is not an open wound communicating with the broken bone; in a *compound* fracture there is. The wound may be caused by the same violence that broke the bone, or it may be caused by the subsequent protrusion through the skin of one end of the bone, due to some movement of the limb after the accident. This is especially likely to happen when the leg is broken, owing to the sharp edge of the shin-bone and the very thin covering of skin and fascia which lies over it. The con-

version of a simple into a compound fracture adds greatly to the danger of the accident, owing to the risk of infection by germs.

Whether simple or compound, fractures may be further sub-divided into *impacted*, when one fragment is wedged into another; *comminuted*, when the bone is broken into several pieces; *multiple*, when there is more than one distinct fracture; *green stick*, when a soft bone, such as that of a young child, bends, and cracks on the convex side, just as a piece of green wood might crack. In fracture of the skull-cap, the portion that is broken may be *depressed* below the level of the rest.

Fractures are also described as *transverse*, *oblique*, and *longitudinal*, according to the direction of the break.

Process of Repair.—Immediately after the injury the ends of the bone are surrounded by blood-clot. In a few days this is replaced by a soft jelly-like mass of granulation tissue, in which lime salts are gradually deposited. This is called *callus*. In the course of the next few weeks this is gradually converted into bone.

Symptoms of Fracture.—These are pain and local tenderness, often bruising and usually shortening, loss of power in limb, change in its outline, mobility of the part owing to want of continuity in the bone, and the sound or feeling of crepitus or grating when the broken ends of the bone rub one against the other. The X-rays are of great assistance in the diagnosis of fractures, since by means of a skiagram the exact nature of the injury can be ascertained. It is no part of a nurse's duty to attempt the diagnosis of a fracture, and should she do so, she may convert a simple into a compound fracture.

First Aid.—Should the nurse see the patient before the arrival of the surgeon, she must, when necessary, be prepared to render first aid, always bearing in mind *the possibility of further damage* to the broken limb as a result of careless handling. Should the accident have taken place in a private house, and the fracture be one of the leg or thigh, it would be better not to attempt to move the patient

until the surgeon has seen him, but to make him as comfortable as possible with pillows and rugs. Sometimes there are painful startings in the broken limb, due to irritation from the sharp ends of the bone, which may thereby be driven through the skin. In such a case the nurse must carefully support the limb, making gentle traction on the lower fragment so as to oppose the working of the muscles.

If the patient must be moved, as would be the case if he had slipped on the pavement and broken his leg, *temporary splinting* must be applied. For this purpose a piece of board, umbrellas, walking-sticks, broom-handles, or several thicknesses of newspaper folded together, might be used, and tied on with handkerchiefs, towels, straps, braces, neck-ties, &c. While this is being applied, the limb must be carefully supported by one person, one hand being placed above and the other below the seat of fracture. While doing so, great care must be taken to hold the limb as nearly as possible in its natural position, the hand that is below the break making gentle but steady traction, so as to maintain the shape of the limb, and prevent displacement of the fragments by the muscles. On no account should the limb be allowed to hang down. Whatever is used to bandage the temporary splints in position should be fastened above and below the seat of fracture, and not over it. When finished, additional security may be given by binding the two limbs together, if it is a leg or a thigh that has been broken. If the injured limb is an arm, it is often sufficient merely to bind it to the side. Should the fracture be compound, a clean handkerchief should be tied round the limb to prevent dirt entering the wound.

While it is most important that a nurse should be able to render first aid in these cases, it is equally important that she should never do more than is absolutely necessary, and under no circumstances attempt to anticipate the work of the surgeon. Further, she must use her discretion, and not attempt to treat all cases in the same way. In a bad Potts' fracture, for instance, the foot may be twisted to an extreme degree on the leg, and the skin drawn so tightly over the

sharp edge of the broken tibia that it seems as if the slightest movement would send it through the skin. In such a case there would be considerable risk of converting a simple into a compound fracture if a rigid splint were applied before reduction had been performed. The better treatment would be to place the foot and leg on a pillow, resting on their outer side with the knee well bent, with soft pads of cotton-wool where extra support is needed, and then fold the pillow over it and fasten it firmly with three or four strips of bandage, tying each one separately round the pillow.

When applying temporary splinting to a fractured limb, the nurse must remember that, whenever possible, the splint must include and extend beyond the two joints between which the fracture lies. If it is the leg that is broken, the splint should reach from above the knee to below the ankle; if the femur, from the arm-pit to the ankle; if the forearm, from the elbow to the hand. In all fractures of the upper extremity the limb must be supported in a sling while the patient is moving about. If the forearm is broken, this will be sufficient; but if the humerus is fractured, a flat pad should be placed between the arm and the side, and the limb secured to the body by a bandage or towel

When a patient with a broken leg or thigh has to be moved a short distance, he should be carried on a *stretcher*, or, failing that, a door or shutter, and never, unless absolutely necessary, placed in a vehicle. Care must be taken to guard against a chill.

A *fracture-bed* should be firm and unyielding. With this end in view deal boards are placed under the horse-hair mattress.

It is better not to remove any of the *patient's clothes* until he has been placed on his bed, the bottom sheet of which is first covered with an old blanket. They are then very carefully taken off, seams being cut where necessary. In a simple fracture of the upper extremity, the sleeve containing the sound limb should be drawn off first. In a compound fracture, the seam of the sleeve on the injured side

should be cut up, and also the shoulder seam, and the coat afterwards drawn off the uninjured limb. In a fracture of the lower extremity, the boots are first carefully taken off, the injured limb being firmly held while this is done. The outer seam of the trouser-leg on that side is then cut up, and the garment afterwards carefully drawn off the sound limb. If the case is one in which, from the position of the fragments, there seems considerable risk of a simple being converted into a compound fracture, it would be better to leave the patient in his clothes until the surgeon has seen him. Otherwise, the temporary splints may be removed, and the limb supported with pillows and sand-bags.

Treatment.—Some form of fixation apparatus is necessary in the majority of cases, but wherever possible massage and passive movements are also used. The fixation apparatus is generally such that it supports the limb, but can be readily removed for a period each day, during which massage, and perhaps passive movement, can be performed.

When the surgeon *sets a fracture* he, as a rule, does so by steadily drawing down the lower fragment, which has been pulled up by the muscles, until the two ends of bone accurately fit together again and its form is restored to what it was before the fracture occurred. If the deformity is considerable, it will be necessary to anæsthetise the patient in order that all the muscles may become flaccid and reduction be made easier. The *splint* is now applied while the fragments are held in position, so that when the operation is finished the two ends of bone may be retained and fixed in the position in which the surgeon has set them. In certain fractures, however, where the deformity is due to muscular contraction, for instance, those of the shaft of the femur, the deformity tends to recur in the form of shortening, and *extension* will have to be applied. Where it is not possible to obtain accurate apposition of the ends, *open operation* may be performed, and the fragments fixed together by bone pegs or grafts, or by Lane's plates or metal wire.

Treatment of Fractures by Massage.—In addition

to securing the accurate repair of a fracture, care must be taken that the normal functions of the part are unimpaired. Excessive wasting of muscles and the formation of crippling adhesions in the neighbourhood of the fracture must therefore be prevented. To obviate such a troublesome state of affairs surgeons now employ massage of the injured limb within two or three days of the occurrence of the injury. Such treatment is especially desirable in fractures involving the wrist and ankle joints, as without it adhesions are sure to form.

(*a*) The accessory splints are removed, the limb being kept in good position on the supporting splint. Gentle *stroking movements* in the direction of the trunk are now made over the muscles involved both above and below the fracture, but at first no pressure is put on the actual side of the break. In this way the absorption of the inflammatory products is hastened, pain is lessened, and the swelling of the limb reduced.

(*b*) After two or three days a firmer touch is used in stroking the limb, and very gentle *passive movements* may be commenced, the ends of the bone being carefully supported with one hand. This will improve the circulation of the muscles and prevent the tendons becoming adherent to their sheaths.

(*c*) At the end of a week the muscles may be gently squeezed and *kneaded*. These manipulations hasten repair, maintain the nutrition of the muscles, and prevent impairment of their functional activity by the formation of adhesions. They should be used as long as the splint is worn.

(*d*) At the end of a fortnight or earlier *active movements*, if they cause no pain, should be encouraged. These are still more effective in improving nutrition.

Compound Fractures.—A compound fracture, as has already been pointed out, is always a much more serious accident than a simple fracture. Should it occur in connection with one of the long bones of the limbs, it is usually attended with a considerable degree of shock, and possibly

a serious loss of blood. It is of the greatest importance that the wound should not become septic, otherwise the patient may lose his limb, or even his life. It is the aim of the surgeon to bring such a fracture into a condition as closely as possible resembling that of a simple fracture. With this end in view, if there is merely a puncture of the skin, the wound is at once sealed with collodion. If there is a more extensive laceration of the skin and subjacent parts, the wound is cleansed and dressed with the strictest aseptic precautions. The limb must now be placed in a splint, such as a box-splint, or one with an interruption opposite the wound, so that it can be watched and any necessary dressing carried out. The patient should be treated as if he had undergone a major operation, and any rise of temperature or sign of constitutional disturbance at once reported.

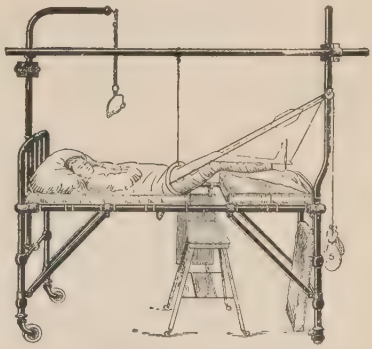
Complications.—At the time of the accident the patient may suffer from shock, or from injury to neighbouring structures. Later, he may develop lung affections, delirium tremens (p. 321), bed-sores, or embolism from liquid fat getting into the circulation. Finally, union may be delayed, or not take place, or result in a faulty position.

Special Fractures.—1. **Femur.**—Fracture of the neck occurs most frequently in *elderly people*, owing to that part of the bone becoming weaker with advancing years. The ordinary evidence of fracture (p. 567) is present, with eversion of the foot. A plaster spica is applied with the limb abducted, and the patient is propped up as much as possible to prevent congestion of the lungs. If pneumonia threatens he must be sat up in bed with the limb between sand-bags. Later a leather spica or a caliper splint is put on, and he is encouraged to get up and move about on crutches.

The shaft of the femur is more commonly the seat of fracture in *younger people*. This type of fracture is treated by splints and extension, the object of the latter being to overcome the tendency of the thigh muscles to pull the lower fragment upwards. If the fracture is in the upper third

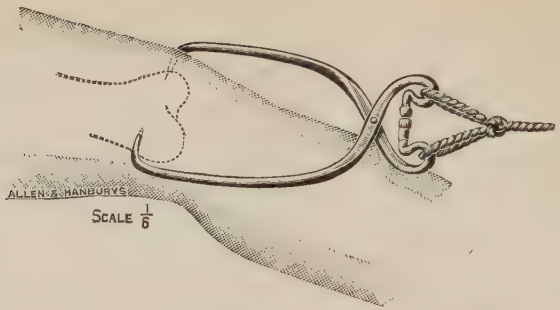
the upper fragment will be flexed and abducted, and it is necessary that the lower fragment should be brought up into line with the upper, extension being applied at the same time in order to overcome the shortening. This is usually effected by means of a Hodgen's splint, or a Thomas knee-splint suspended from a Balkan frame may be used. In fractures of the middle and lower thirds the same apparatus is used. The knee should be kept slightly flexed.

In *young children* a Thomas knee-splint may be used, or the limb placed in plaster in the fully abducted position. In *infants* the extension is sometimes applied vertically — that is to say, extension stirrups and strapping are put on both legs, and the two limbs are then suspended from a wooden bar ("gallows") running across above the cot from side to side. By this means the child's buttocks are raised just clear of the bed, so that it is easily kept clean; but it not always a simple matter to prevent it getting chilled. If the child will not keep still, it is restrained by means of a chest-band.

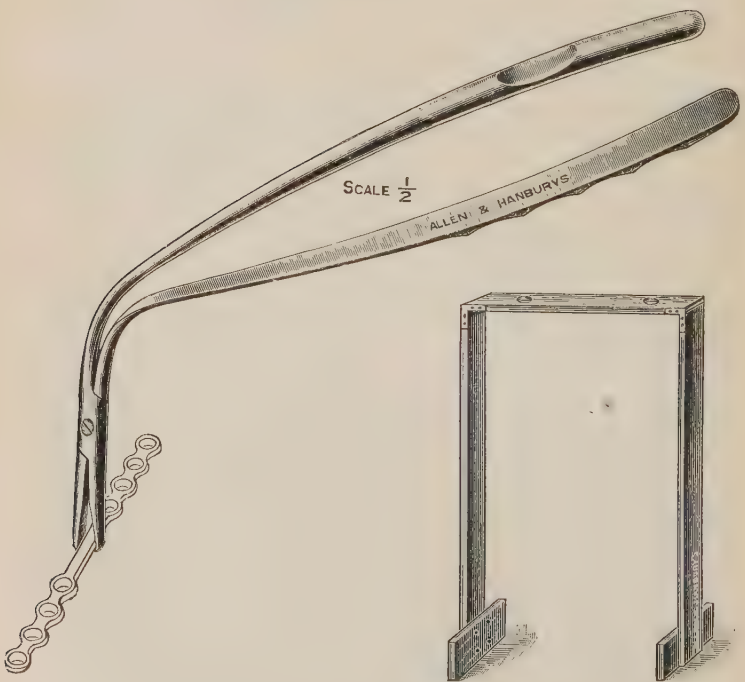


The "Pearson" Fracture Bedstead, with a section of mattress let down as for dressing.

2. **Spine.**—There is no more serious accident than this, nor one which requires more care in nursing. The patient should at once be placed on a water-bed, and only allowed one pillow. If the fracture is in the cervical region, the head should be steadied with heavy sand-bags laid round it. Hot bottles and restoratives will probably be needed, as these patients suffer greatly from shock. The bottles must not be too hot, and the flannel bags in which they are placed must be carefully examined to see that they are free from holes; for the shock of the accident dulls the



Pearson's Traction Calipers, for fractured femur.



Lane's Plate-holding Forceps, and Plate for fractures.

"Gallows" for fracture of femur in young children.

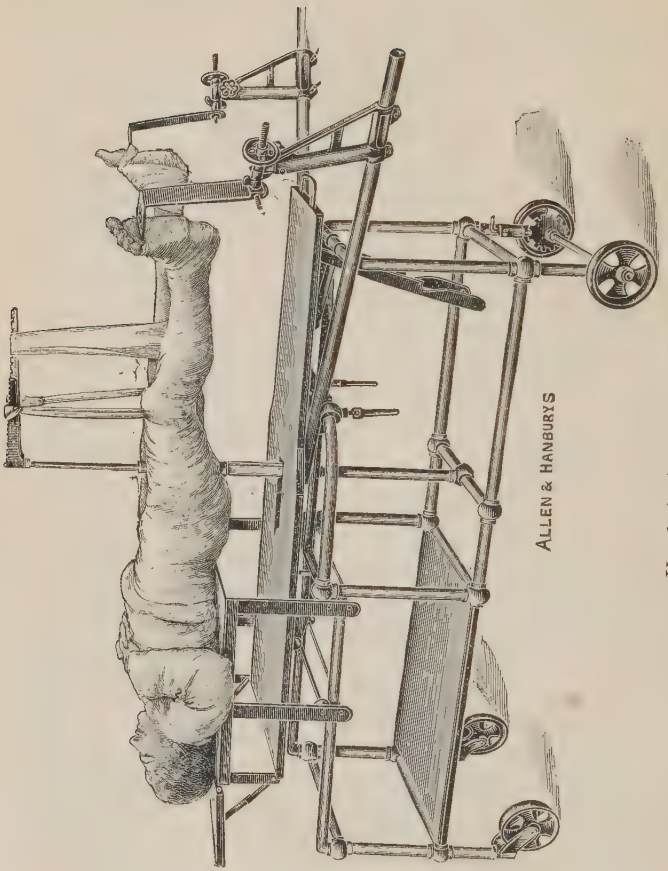
patient's sense of pain, while the failure of nerve-supply, and consequent lack of nutrition in the parts below the seat of fracture, due to injury of, or pressure on, the spinal cord, make the occurrence of a burn only too likely.

The illness following this accident is usually long and tedious. Since there is complete paralysis below the fracture, there is almost certain to be incontinence of urine, and frequently of fæces, which, together with the unchanging position of the patient, renders the prevention of bed-sores most difficult. The night-gown should be open down the back, and laid on the patient, not under him.

The back should be kept scrupulously clean with the aid of soap and water. The assistance of at least three nurses will be required each time it is washed. Two should stand on one side of the bed, and the third, with everything ready for washing, on the other side. The two nurses now roll the patient on to his side by gently pulling on the draw-sheet. Having drawn him into the required position, they support him with their hands, while the third nurse washes the back carefully and thoroughly. Her touch, though gentle, should be firm, as jerky movements may do much harm. When the back has been thoroughly dried with a warm towel, ointment should be applied, particularly on and between the buttocks. This must be rubbed *in*, and the gentle massage necessary to do so, by improving the circulation, will help to maintain the vitality of the part. With the help of the draw-sheet, the patient is now allowed to turn slowly on to his back again.

Male patients may be kept comparatively dry by placing a urine-bottle in position, and emptying it at short intervals. With females any arrangements of this nature are more difficult to carry out, but an ingenious nurse may do much with absorbent wool and jaconet.

3. **Pelvis.**—This is accompanied by much shock, and causes a great deal of pain. There is always a likelihood of grave internal injury. Fracture boards are placed under the mattress and a pillow behind the knees, and the pelvis is supported by a broad flannel bandage. The patient should



Hawley's Orthopædic Table.

not pass urine until a catheter has been used, in case the *urethra* has been injured.

4. **Skull.**—(*a*) *Of the Vault.*—This is usually compound, the scalp being cut through at the same time that the bone is broken. The most serious form of this injury is that in which a portion of the bone is driven inwards below the level of the rest, in which case the fracture is said to be "depressed." The operation of *trephining* is frequently performed in these cases, for the purpose of rectifying the displacement. Perfect rest in bed in a darkened room, with a light diet, regular action of the bowels, and an ice-bag to the head, are the most necessary elements in the treatment of these cases. Especial care must be taken by the nurse to prevent the wound becoming septic, as in that case meningitis and death would probably follow.

Occasionally, after a blow on the head, a patient, about the fracture of whose skull there may even be some doubt, *gradually becomes comatose.* This is an indication that an artery which runs on the inner surface of the skull-cap has been torn through by the fracture, and that it is pouring out blood, which is pressing on the brain. Unless trephining is carried out, the clot removed, and the bleeding stopped, the patient will very soon die. In every case of injury to the vault of the skull the nurse should for the first few hours watch the patient closely for any signs of *commencing* unconsciousness, and promptly inform the surgeon if they appear.

(*b*) *Of the Base.*—This form of injury may be caused by a blow on the cranium, or may follow a fall from a height on to the feet or buttocks, the vertebral column being in such a case driven up against the floor of the skull and breaking it. An important symptom in these cases, for which the nurse should watch and report, is the escape of blood and cerebro-spinal fluid from the nose and ear. When the latter occurs, it is absolute proof that the base of the skull has been fractured.

The same perfect rest and quiet are needed as in injuries to the vault, together with free purgation and the use of

an ice-bag. The nurse must remember that the fracture is a compound one when cerebro-spinal fluid escapes from the ear. That organ must therefore be kept scrupulously clean, and covered with a pad of gauze and absorbent wool.

5. **Jaw.**—As the mucous membrance of the mouth is generally torn, this fracture is to be regarded as a compound one and every effort made to keep the mouth aseptic. Feeding by means of a tube may be necessary ; only fluid or very soft food requiring no chewing movements should be given.

6. **Clavicle.**—This is usually the result of force applied to the hand or shoulder. It is usually through the greater convexity, rarely near one or other end. In children it is often greenstick. The patient supports the elbow on the other hand, and the arm is powerless ; the shoulder is less prominent than usual, and there is a slight bony projection at the seat of the fracture. It is reduced by placing the knee between the scapulæ, and drawing the shoulders backwards and upwards. To maintain the ends in opposition, Sayre's strapping method is usually employed. Ununited fracture is uncommon, but union in bad position is not rare. When it is caused by direct violence, the subclavian vein, brachial plexus, and even the dome of the pleura may be injured.

7. **Colles' Fracture** is a fracture through the lower end of the radius, which is displaced backwards and forms a prominence at the back of the wrist. It is most frequently seen in women, and results from falling upon the outstretched hand. The deformity having been reduced by forcible extension, a Carr's splint is usually applied. This has the advantage of leaving the fingers free. Massage and movements of the fingers are regularly carried out from the first.

8. **Potts' Fracture** is a fracture of the lower end of the fibula with tearing of the internal lateral ligament or breaking off of the tip of the inner malleolus. It generally results from a slip. The foot is displaced outwards and backwards. Various splints, such as Neville's back-splint with two side-splints, are used for this fracture. Complete

and early correction of the deformity is a most important part of the treatment, since of all fractures this is the one most likely to be associated with impaired usefulness of the limb owing to persistent deformity. Massage should be commenced early.

9. **Patella.**—Usually the fragments are wired together, passive movements and massage being commenced about the tenth day.

General.—Firm union usually results in the case of a phalanx in two weeks; a rib, three weeks; the carpus, metacarpus, tarsus, and metatarsus, three to four weeks; fibula alone, four to five weeks; clavicle and forearm, five to six weeks; humerus and tibia, seven to eight weeks; and femur, two to three months. The patient is usually able to return to work about a fortnight later, except in the case of the tibia (two to three months), and the femur (six to eighteen months).

II. Injuries and Diseases of Joints.

1. **Sprain.**—The ankle is the joint most subject to this form of injury, which results in a stretching and tearing of the surrounding structures, especially the ligaments. As a result, considerable swelling of the part quickly comes on, with pain and, in severe cases, inability to use the limb.

Treatment.—If the joint is seen before much swelling has taken place, thick layers of absorbent wool should be wrapped round it, and firmly bandaged in position. It is important that the bandage should be firmly applied, as the object of this method of treatment is to keep down the swelling by diminishing the effusion of fluid from the injured vessels.

If, by the time the joint is seen, considerable swelling has taken place, wool soaked in hot water may be bandaged firmly round the injured part.

The part should at first be kept at absolute rest, but about the third day the surgeon will probably order the

damaged joint to be massaged, and gently moved about by the nurse. Early movements aid in the absorption of fluid, and tend to prevent the torn ligaments and surrounding tissues becoming glued together, and so producing a painful and crippling stiffness.

2. **Dislocation** is said to be present when the ends of the bones which form a joint are displaced from their normal relation to one another. A dislocation may be *traumatic* (simple or compound), arising from direct or indirect violence; *pathological*, resulting from destruction of a joint from disease; or *congenital*, due to an error in development occurring before birth. If incomplete, it is called a "subluxation."

Signs.—Swelling and bruising from local injury; deformity, as shown by abnormal prominences of bone; impaired mobility and alteration in length of the limb. The head of the bone is absent from the place where it should be, and present where it should not be.

Treatment.—Pending the arrival of the doctor, the nurse should make the patient as comfortable as possible, support the injured limb, and apply a cold-water dressing with a view to diminishing the amount of effusion. The clothes should be removed as in cases of fracture. With or without an anæsthetic the surgeon manipulates the limb so that the bone retraces its course through the hole in the capsule. The limb should be rested for a few days (the arm in a sling, the leg between sand-bags), and passive movements begun in a week or ten days; massage may be commenced at once.

3. **Acute Synovitis.**—In this form of joint trouble there is acute inflammation of the synovial membrane which lines the joint and secretes the thick glairy fluid which bathes the joint surfaces and makes it work smoothly. As a result of the inflammation, there is a sudden increase in the amount of fluid poured out, so that the joint becomes distended, hot, and painful. This condition may be caused by an injury such as a sprain, or may be the result of a constitutional disease like rheumatism or gout.

Treatment.—The inflamed joint must be kept at rest on a splint. The character of the local application will depend upon the cause of the inflammation.

4. **Acute Arthritis,** or **Septic Arthritis,** is a very much more serious condition, in which the joint is rapidly destroyed by the formation of pus. This may be caused by an open wound of the joint, or it may be the result of pyæmia or scarlet fever. The constitutional symptoms are very severe and the danger to life great.

Treatment.—Free exit will be given to the pus, and the joint thoroughly washed out and drained. As this is a dangerous and exhausting illness, the patient will need very careful nursing.

III. Tuberculosis of Joints.

Tuberculous Joint Disease, especially in children, nearly always arises in the articular end of the bone, and spreads towards the joint, which speedily becomes tuberculous. The synovial membrane now becomes thickened and ulcerated, and the cartilage separates from the bone in patches. At the same time the muscular spasm causes the softened ends of the bones to be crowded together and worn away, and the affected tissues break down into purulent material. In this way *cold abscesses* may arise. When the resistance of the patient predominates over the infection, repair will occur; the caseous material will be largely absorbed, and the destroyed joint surfaces will become bound together with fibrous tissue, causing "fibrous ankylosis," and this later may be converted into "bony ankylosis."

Joint tuberculosis is essentially a disease of childhood, and in over three-quarters of the spine, hip, and knee cases it commences before the age of ten. It usually begins insidiously, and swelling, pain on attempted movement, deformity, and slight rise of temperature in the afternoon, are the usual symptoms observed.

Treatment.—The constitutional treatment, which is of the utmost importance, is directed toward increasing the resistance of the patient, while local measures are taken to preserve the joint structure with a view to its recovering its function as far as possible.

(1) *Local treatment* may consist in (*a*) fixation, (*b*) traction, or (*c*) protection. Thus, *fixation* is necessary when motion in the diseased joint would interrupt the processes of repair; *traction* is required when, as in the case of the hip, the strong muscles which control the joint are in a state of spasm and press the diseased bones together; while *protection—e.g.*, in the form of weight-bearing apparatus in the convalescent stage of hip disease—is needed to prevent newly repaired tissue being irritated or damaged. Cold abscesses are often absorbed; if not, aspiration is done.

(2) *Constitutional treatment.*—It is important in this, as in other forms of tuberculosis, that the patient should be placed in the best hygienic conditions possible. Fresh air and sunlight are most essential. He should therefore spend as much time as possible out of doors, and when in bed the windows of his bedroom must be kept open day and night, extra warmth, when necessary, being supplied by means of blankets and hot bottles. If the patient's circumstances allow of his removal to the country or seaside, his chance of recovery is materially improved. The diet should be abundant, nourishing, and easy of digestion, and contain an ample supply of fat.

Continuous Outdoor Life is now largely adopted in the treatment of these cases. The appetite and weight show immediate improvement, anæmia speedily disappears, while respiratory troubles and spread of infectious disease are almost unknown. In winter the children should have a small blanket next them, with hot-water bottles or loose blanket-bags for the feet, and woollen gloves or mittens for the hands.

Heliotherapy, or sun treatment, is an invaluable addition to open-air life. At the commencement of treatment,

exposure must be gradual both as to the extent of surface and the period. Thus, the feet are exposed on the first day for half an hour; on the second day, the feet for an hour, and the legs for half an hour; on the third day, the feet for one and a half hour, the legs for an hour, and the thighs for half an hour; and so on until the whole body is exposed for several hours a day. In hot weather the patient should be placed in the shade during the heat of the day; at the slightest sign of sunburn the patient should be covered and calamine lotion applied to the part; the head should be protected by hat or sunshade, and the eyes should be directed away from the sun or protected by tinted glasses. Red-headed and freckled children do not pigment, and show more susceptibility to burning than do those who pigment well.

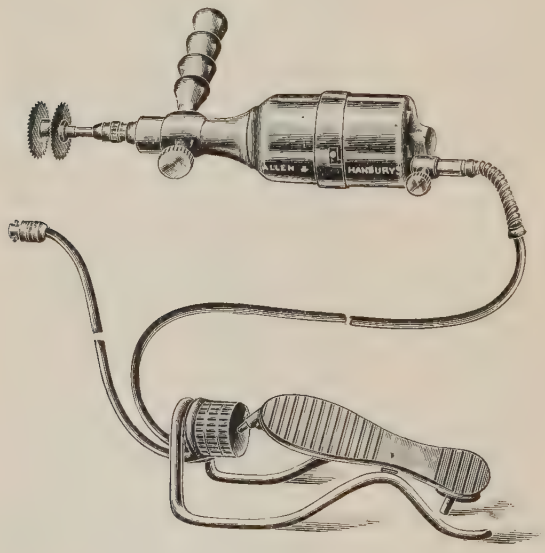


Heliotherapy. A Class in the sunlight at Carshalton. Cases of Tuberculosis of Spine and Hip treated on Frames and Carriages.

1. **Spine.**—*Spinal caries*, or "Potts' disease," is one of the most common forms of tuberculosis in children. The

favourite seat of the disease is in the lower part of the dorsal region, though it may affect any part of the spinal column.

When it begins in the interior of the vertebra, as it usually does in children, it presents soft deposits, which make their way to the surface on the front or sides of the bones and spread over them, causing superficial caries. As a result of this periosteal extension, the inter-vertebral



Albee's Electric Motor Saw, for bone transplantation.

cartilages of the adjacent vertebræ disappear. The deposits destroy partially or completely the bodies of the vertebræ in which they occur, producing abscesses and sometimes sequestra. The weight of the parts above causes the vertebræ, the lime salts of which are largely absorbed, to collapse. Curvature results, sharp if only a single body is destroyed, and more gradual if several vertebræ are partially affected.

Symptoms.—In the early stages of this affection, before there is any sign of deformity, pain and spinal rigidity are present. *Pain* is complained of not only at the seat of disease, but also in distant parts, such as the abdomen or limbs. *Spinal rigidity* is obvious from the way in which the child avoids bending his back. If he wishes to pick anything off the floor, he does so very slowly and carefully, and will often kneel down rather than stoop in the ordinary way.

As an *abscess* increases in size, it makes its way to the surface of the body, pointing in certain well-recognised situations which vary with the part of the spine affected. An abscess, for instance, which has formed in connection with one of the lower dorsal or lumbar vertebræ will, as a rule, enter the sheath of the psoas muscle and, passing into the iliac fossa, open on the thigh (psoas abscess); sometimes it appears in the loin (lumbar abscess). In cervical caries, it develops behind the pharynx (retropharyngeal abscess), and may point in the neck.

Disease of the upper part of the spinal column often gives rise to pressure on the spinal cord, causing *spastic paralysis* of the lower limbs, which is sometimes associated with incontinence of urine and fæces and a tendency to the formation of pressure-sores.

Nursing and Treatment.—Movement of the spine must be reduced to a minimum, and especially all superincumbent weight must be removed from the bodies of the affected vertebræ. There has never yet been devised a jacket or splint which is capable of relieving the *erect* spine of a child from superincumbent weight, and it is necessary to keep the patient in the *horizontal* position to effect this.

Deformity may be prevented if the patient comes under treatment early enough. If already present, it may be lessened by modifying the natural curvature of the healthy part of the spine to compensate for the abnormal curve in the diseased sector. It is important, however, that this should be done without separating the surfaces of the affected vertebræ. Growth is naturally stunted in the diseased

bodies, but will go on normally in the healthy ones, with the result that a prominence which occupies a considerable fraction of a young child's spine will become much less obvious after some years' growth, provided a compensating modification of the curvature of the rest of the spine has been secured. This compensating curve can be obtained by placing a pad (or, if a frame is used, making a bend) in the appropriate place—viz., a little above the hump in the case of disease of the lower dorsal or lumbar region, or a little below it if in the upper dorsal region. At the same time the constant pressure on the spinous processes flattens them, and thus still further reduces the prominence of the hump.

The *appliances* most generally used in this country are the various types of spinal frame, the double Thomas splint (p. 125), the Berck tray, the plaster bed, and the recumbent plaster jacket. Whatever apparatus is used the nurse must see that the child does not undo the straps and partially sit up; that the skin of the back receives any necessary attention without disturbance of the diseased spine; that a pad is placed behind the knees to keep them slightly flexed, otherwise they will become over-stretched; and that the child several times a day fully dorsiflexes his feet, lest he get contracture of the tendo Achillis and foot-drop. The child may be encouraged to exercise his legs at intervals, and so diminish the tendency to wasting of the muscles of the lower limbs from disuse. When the lower part of the spine is affected, however, the thighs must be kept flat and quite still; drawing the legs up would throw the psoas muscles into action, and this would mean disturbance of the seat of disease.

When the acute symptoms have subsided and the patient is approaching convalescence, it is a good plan to let him lie on his face for two hours at a time, resting the weight of the upper part of the body on the elbows and exposing the back to the sun. The condition of the skin is thereby greatly improved, and the spinal muscles develop in a remarkable way.

In caries of the *cervical and upper dorsal region* it may be advisable to apply extension to the head by bridle, stirrup, weight, and pulley, the head of the bed being raised at the same time on blocks. The "bridle" is made of webbing, one piece passing over the forehead and the other under the occiput, the two being mitred together on each side above the ear where the stirrup webbing joins them. No webbing should pass under the chin, otherwise the growing jaw will become deformed.

The *spastic paralysis* of the lower limb which may result from disease of the spine is sometimes relieved by head-extension. In persistent cases laminectomy is occasionally done; the spinal canal is opened from the back, and the pressure on the cord by the products of inflammation removed as far as possible.

Treatment in the horizontal position is usually necessary for two or three years, and until clinically there is fixity of the diseased vertebræ and complete absence of rigidity in the rest of the spine, and X-ray examination shows that the lime salts have been redeposited in the bones. When the patient is considered to be well enough to commence walking again, he is given a steel spinal support or a jacket made of celluloid or poroplastic felt strengthened by metal. If the disease is higher than the eighth dorsal vertebræ, the jacket is usually made with a head-piece to hold the head and shoulders in the fully-extended position. In cervical caries, a Thomas collar is often used.

In recent years use has been made of *Albee's operation*—viz., splitting the spinous processes of the affected vertebræ and those above and below them, and laying in this bony trough a bone-graft taken from the patient's tibia, this leading to fixation of the diseased part of the spine. It is of considerable value in patients over the age of fourteen, in whom it allows of the recumbent position being abandoned after a shorter period than would otherwise be possible.

2. **Hip.**—In tuberculosis of the hip the early sign is usually a limp, noticed especially in the morning; "night cries" may appear early, and severe pain may supervene

or there may be only increasing stiffness with deformity; later, walking becomes impossible, and abscesses may appear. Atrophy of the thigh muscles, spasm of the muscles controlling the hip, pain which is often referred to the front of the thigh or to the knee, lameness, and apparent shortening are other symptoms.

When the articular surfaces have been destroyed by the granulation tissue, "starting pains" begin to interfere with the patient's rest. As he drops off to sleep the muscles, which during his waking hours were rigidly contracted so as to keep the joint quite still, become relaxed and allow the inflamed bones to rub against one another. As a result, the muscles contract suddenly and violently, causing extremely severe pain in the joint.

Shortening is called "apparent" when it results simply from the tilting up of the pelvis on the affected side, which tilting is associated with adduction of the limb. "Real" shortening results either from absorption of the head of the femur and the upper part of the acetabulum, or from arrested growth of the limb, or from pathological dislocation—*i.e.*, the gradual slipping of the femur upwards upon the dorsum of the ilium, after the head of the bone and the upper rim of the acetabulum have been in part or entirely absorbed.

The *posture* of the limb in the early stages of hip disease is very characteristic, the affected limb being slightly flexed at the hip, abducted, and rotated outward. The patient adopts this position because it is the one that gives him greatest ease; it is the position we habitually assume when we sit at rest, with the lower limbs flexed, the knees apart, and the heels nearly touching. When the limb has thus become flexed on the trunk and fixed there by muscular rigidity, the patient must, if he wishes to stand, curve his lumbar spine forward (*lordosis*) in order to bring the limb down in a line with the trunk.

Later the limb usually becomes adducted and externally rotated. This is a deformity which should if possible be prevented, for in addition to interfering with walking and

increasing the apparent shortening, it is apt to lead to scoliosis from tilting of the pelvis, and also to some degree of knock-knee.

Treatment.—Extension is a most essential part of the treatment ; by means of it the faulty position of the limb can usually be corrected. A cradle should be used to protect the feet from the weight of the bedclothes, and in cold weather light wraps are necessary to keep the feet warm. The extension may be by weight-can on an ordinary bed furnished with fracture boards ; or suspension on an inclined plane (p. 129) may be used. Extension is most useful in cases where "starting pains" are a distressing feature. These are completely abolished by its use, which relieves the spasm and prevents the muscles rubbing the inflamed bones together. Fixation on a Jones's abduction splint is sometimes used.

When the hip is fixed at an angle with the body and weight extension is being used, pillows or a wooden slope should be placed under the whole limb to support it in this flexed position, and the pulley fixed at such a height that the pull is exerted in the direction in which the thigh is lying. The pulley is gradually lowered as the angle of flexion of the hip is decreased. In arranging the position of the limb it is also necessary to take into account the adduction or abduction. If when the limbs are parallel the anterior iliac spine on the affected side is lower than the opposite one,so that there is apparent lengthening,this means that the limb is *abducted ;* if the anterior iliac spine of the affected side is higher than the other, the limb is *adducted.*

Lest secondary deformities should be added to the original one, attention must be paid to the following points :—

(1) The line joining the two anterior iliac spines (interspinous line) should be kept parallel to the foot-rail of the bed ; if not, the tilting of the pelvis will make the spine crooked, with a liability to the development of a permanent *scoliosis.*

(2) The pull of the weight extension must be in the direction of the line of the thigh of the affected side, otherwise

the pelvis will merely tilt and no correcting influence will be brought to bear on the affected hip, and further, the knee will be strained laterally with a result that *knock-knee* may be caused. Adduction should, therefore, be corrected by an extension in the line of the femur on the affected side, while the pelvis is held in the proper position by means of a perineal band. As the adduction becomes corrected the extension pole is moved outwards, and thus the interspinous line is kept parallel with the foot-rail of the bed.

(3) The knees should be kept slightly flexed, otherwise there is liability to over-extension (*genu recurvatum*).

When a patient first begins to get about again he does so with crutches, a high boot or patten being placed on the sound side, and, as a rule, a Thomas splint, a plaster, leather or celluoid spica applied to the other. This form of treatment is persisted in for a period varying with the severity of the case, but it will be many months after all symptoms have disappeared before the patient is allowed to put any weight on the affected limb. When crutches and splint are abandoned, any permanent shortening of the limb is corrected by means of a cork-soled boot.

3. **Knee.**—The symptoms are swelling, pain, lameness, muscular atrophy, and deformity. The deformity, as in the case of the hip, originates in muscular spasm; it is troublesome and persistent, and consists principally of flexion, with displacement backwards of the tibia on the condyles of the femur.

The constitutional *treatment* has been described above. Fixation may be obtained by a plaster-of-Paris bandage reaching from the fork (or better the waist) to the malleoli; or a Thomas knee-splint (p. 125) may be used. Recumbency is necessary in acute cases, or when abscess threatens. Flexion deformity should always be corrected as soon as it appears, either by a Thomas bed-splint or a succession of plaster bandages, or by means of weight extension applied in appropriate directions, the limb being slung from a Balkan frame.

4. **Other Joints.**—The *ankle* and *tarsal joints* are not infrequently affected, and should if possible be treated by immobilisation, with the foot raised well above the level of the body, in the open air and sunlight. Treated in this way, the disease is usually much more rapidly overcome than if the patient is allowed to walk about in a Thomas knee-splint, or on crutches with the foot in plaster. Remarkably good movement generally results.

The *shoulder* is much less frequently attacked, and suppuration occurs less often. The limitation of movement of the arm also is not so marked as in other joints, on account of the mobility of the scapula on the thorax. If ankylosis is likely to result, care should be taken that it occurs with the humerus abducted from the scapula in order to get a useful arm. The position is best obtained by the use of a plaster-of-Paris case, extending down to the pelvis on the affected side and holding the arm abducted and the elbow flexed.

The *elbow* is fairly often affected, the disease usually beginning in the olecranon or the external condyle of the humerus. It is treated by rest and fixation with the elbow flexed to a right angle. A Thomas collar-and-cuff sling is often used; it consists of a piece of broad bandage, which is passed twice round the wrist and knotted, and again knotted near the neck, around which it is tied.

A tuberculous *wrist* is treated by immobilisation in a splint which dorsiflexes it 50 degrees, for should the joint become fixed in the straight position the fingers would lose much of their grasping power.

In tuberculous *sacro-iliac* disease, the joint is painful on walking and standing; it has to bear at each step the body weight, and a shuffling gait results. It is treated by recumbency, a Thomas double frame or a double plaster spica being often used.

IV. Congenital Deformities.

1. **Club Foot** is termed *talipes equinus* if the foot is turned downward; *talipes calcaneus*, if upward; *talipes varus*, if inward; and *talipes valgus*, if outward. These deformities are often combined, the most common being *talipes equino-varus*, in which the heel is drawn up and the front part of the foot twisted inwards. If the arch of the foot is much hollowed out, the condition is known as *pes cavus*. In each case the ligaments and fasciæ are contracted, and the bones distorted to conform to the position, and corns and callosities develop on the parts abnormally subjected to pressure in walking.

The Treatment of Talipes Equino-varus should begin within three weeks of birth, and usually has to be continued for many years, for there is a marked tendency to relapse as long as growth goes on. The deformity consists of two parts, the equinus and the varus, and the latter is dealt with first. This usually takes nine months or so, and then the equinus is corrected, if necessary by lengthening the short tendo Achillis.

The varus twist is undone by (*a*) bandaging the lower end of a small straight splint to the foot, and then forcibly untwisting the foot by fixing the upper end to the outer surface of the leg; (*b*) manipulating the foot several times daily. The manipulation should last ten minutes; the nurse or mother—using her two thumbs, placed together beneath the outer side, as a fulcrum—uncurls the foot repeatedly, using all the force she can short of making the child cry; afterwards the foot is powdered and the splint reapplied. As correction occurs, the splint is bent to increase its effect. After the tendo Achillis has been lengthened, a right-angled tin night-shoe should be used for some years. As soon as the child begins to stand, it is allowed to do so in the splint; when it can walk, it should be given ordinary boots, which, if there is any tendency to

varus, should have a $\frac{1}{4}$-in. varus wedge added to the outer side of the sole and heel, so as to evert the foot.

Neglected or resistant cases require manipulation under an anæsthetic, or an open operation, followed by a plaster-of-Paris case.

2. **Congenital Dislocation of the Hip** is more common in girls than boys. The child does not walk as early as most children, and when she does the gait is limping or waddling, and there is prominence of the affected hip with shortening of the limb. It is important that these cases should be treated early, for the result is unsatisfactory if the child is over seven in the case of single, or five in the case of double dislocation. The treatment consists in manipulating the displaced femoral head into the normal position under an anæsthetic by Lorenz's method, and holding it in the abducted position for from six to ten months in a plaster case, until it has made a more perfect socket for itself. Some surgeons like the child to walk in the plaster within a few weeks ; others wait several months. Others keep the child in bed until the plaster is discarded, and then supply a caliper splint.

V. Deformities Acquired at Birth.

1. **Torticollis** is due to contracture of the sterno-mastoid muscle, which may occur before birth or result from hæmorrhage into the muscle during birth. The ear of the affected side is lowered, and the chin is rotated a little towards the other side. The face is not symmetrical, its length being less on the affected side. If early corrective manipulation fails to effect a cure, it will be necessary to divide the muscle near the clavicle and put the head, neck, and chest in plaster in the fully corrected position, using later massage and corrective exercises (" head-turning " and " head-sideways-bending "). Care must be taken to report the slightest indication of relapse.

2. **Cerebral Diplegia.**—See p. 309.

3. **Obstetrical Paralysis** is due to an injury at birth, especially in cases of difficult labour, affecting the nerves of the brachial plexus, and resulting in paralysis of the upper arm only (*Erb's paralysis*), the lower arm only, or the whole arm. The limb, as early as possible, should be placed in a Fairbank splint, with the arm raised to the level of the shoulder and rotated outwards, the forearms flexed and supinated, and the wrist dorsiflexed—*i.e.*, in the position opposed to the deformity. Later, massage and muscular re-education are of value, the splint being removed daily and the child encouraged to make voluntary movements of the affected muscles. Operation may be advisable if satisfactory improvement does not result.

VI. Deformities Acquired after Birth.

1. **Resulting from Rickets.**—(See p. 329.) (*a*) In *Bow-legs* the curvature is usually of the tibia and fibula, sometimes the femur. A mild case may be treated by making the child, when walking about, wear an inside iron splint, extending from the bottom of the shoe-heel to the middle of the thigh and firmly bandaged on. Severe cases are treated by breaking the bones over a wedge (*osteoclasis*).

(*b*) *Knock-knee*, or *Genu Valgum*, starts as a postural deformity, the lower limbs sagging in at the knees owing to the relaxation of the ligaments around these joints. Later, the internal lateral ligament becomes permanently lengthened, and the weight falling unduly on the external condyle, the latter grows less than the internal condyle, so producing bony deformity.

For slight cases the best splints to use are the Thomas knock-knee splint or a caliper knee walking-splint, with a knee-cap which has a lateral flap buckled to the outer iron to draw the joint outwards. In applying this, the knee must be fixed *fully extended* by the front knee-cap before the straps of the lateral flap are tightened, for if the knee

is at all flexed the limb merely rotates in the splint, and no corrective effect is obtained. Very slight cases can generally be cured by merely wedging up the inner side of the soles and heels a quarter of an inch. The more severe cases require division of the femur above the condyles (*supra-condylar osteotomy*). After osteotomy a plaster case, or preferably a Thomas knee bed-splint, is applied. It is often advisable for the patient to use during the first few months of convalescence a caliper splint when walking.

2. **Resulting from Infantile Paralysis.**—(See p. 310.) The lower limbs are much more commonly affected than the upper. In the former, the anterior extensors of the ankle (particularly the tibialis anticus) are the muscles most frequently permanently paralysed; in the latter, the deltoid and biceps. The precautions to prevent deformity in the early stages have already been described (p. 311). If the anterior muscles of the ankle are paralysed or weak, the deformity of *equinus* occurs; if the calf muscles, *calcaneus;* if the muscles on the outer side of the leg (peronei), *varus;* and if those on the inner side (tibialis anticus and posticus), *valgus.*

Nursing.—It will be well to emphasise several nursing points:—

(*a*) The limb should never be allowed to be cold and bluish, as so often happens; it should be got warm in bed, and then stockings should be added one by one until the paralysed leg remains as warm as the other one, and the child's boot should be large enough to allow of this extra clothing. In addition, a fur-lined gaiter is useful for outdoor wear.

(*b*) The affected limb should not be allowed to hang down unnecessarily; when not in use, the arm should be supported in a sling, the leg upon a chair. The circulation may be improved by giving a short hot bath morning and evening, and massage is of some use for the same purpose.

(*c*) The paralysed muscles must not be allowed to become over-stretched; the stretching and elongation of the paralysed dorsi-flexor muscles, which result from dropping

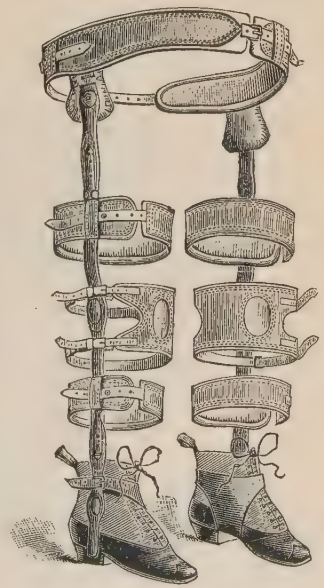
of the foot, cannot be remedied if of long standing. In a case of paralysis of the dorsi-flexors of the ankle, therefore, a right-angled tin night-shoe should be worn at night, and in the day too if the child is not walking. It is important that this splint should be effectual, particularly that the heel should be kept down on the foot plate by a firm bandage or strap applied over the front of the ankle. Too often the splint is so applied that it slips, and, the foot being kept in the pointed position, it does harm rather than good. If the calf muscles are affected, an obtuse-angled night-shoe is used; if the quadriceps, a Thomas knee bed-splint; if the deltoid or biceps, a Fairbank splint; while if the erector spinæ is affected, the back should be kept well extended on pillows. These are useful for two or three years after the onset of the disease.

(*d*) When the acute stage of the disease is over, every effort should be made to get the patient to move and use the affected limb, for example, by encouraging him to walk and run.

Walking instruments.—These are used if the condition is so severe that the patient walks with difficulty or not at all, or when there is a tendency to the production of deformity. They are not advisable for every case, for they hinder further recovery by doing the work of the muscle for it. Thus, if there is a simple varus or valgus condition of the foot, a $\frac{1}{4}$-inch wedge of leather, applied to the outer or inner side respectively of the heel and sole, will usually suffice to keep the foot in good position. If there is foot-drop, a single walking instrument to the knee with a toe-raising strap is used. If valgus is considerable, an internal T-strap is added; this is sewn to the inner side of the heel and divides to encircle the ankle, being buckled round the iron to draw the ankle over to it. For a paralysed quadriceps a Thomas caliper knee-splint is used; if there is foot-drop also, a toe-raising strap is attached to the knee-cap, and if there is knock-knee, a lateral knee-cap is added to pull the knee towards the outer iron. Care must

be taken that all instruments are properly applied, that the straps are sufficiently tightly buckled, and that any joints are kept well-oiled.

Operations.—In severe cases of shoulder paralysis when the joint is quite flail it is often an advantage to ankylose it artificially (*arthrodesis*). In the condition of flail ankle, a similar operation may be done, or the foot may be stabilised by removing the astragalus and displacing the foot backwards (*Whitman's operation*). In less severe cases the tendon of a healthy muscle may be transferred to take the place of a neighbouring paralysed one (*tendon transplantation*).



Walking Instrument for Infantile Paralysis, with Pelvic Band, Knee-caps, and Internal T-straps.

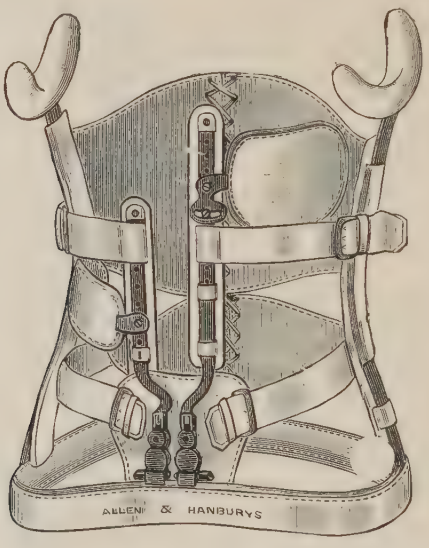
3. **Spinal Curvature** is due to weakness of all the structures of the back (bones, muscles, and ligaments), combined with long sitting or standing in stooping positions.

(*a*) *Stoop*, or *Round Shoulders* (sometimes called "kyphosis," which term is best reserved for the angular deformity of spinal tuberculosis), is common among children at the most rapidly growing age, eight to fourteen years. If the position is not corrected, it is apt to become a fixed deformity. The treatment is to instruct the patient in exercises to strengthen the muscles of the back, abdomen, and respiration, and to cultivate an erect posture. Particularly the child should be exhorted to hold the chin back.

(*b*) *Lordosis*, or bending forward of the lumbar spine, is usually a secondary deformity, resulting, for example, from

double congenital dislocation of the hips or round shoulders.

(*c*) *Scoliosis*, or *Lateral Curvature*, generally arises from weakness, in association with a wrong posture, especially in writing, reading, or sewing. Structural deformity may develop from this postural deformity; very severe cases sometimes result also from rickets and infantile paralysis



Spinal Support, for double lateral curvature, with crutch-pieces and adjustable back plates.

affecting the spinal muscles. The cases may thus be divided into two groups—the *postural*, which is generally curable; and the *structural*, for which little can be done.

The curve is generally shaped either like a C or an S reversed. In structural scoliosis, in addition to this general curve, there is rotation of the vertebræ, which causes the ribs on the convex side to be carried backwards and thus get sharper angles, and so produces deformity of the chest.

If the patient is inspected from behind while stooping down, the projection backwards of the ribs is well seen.

Treatment should include attention to the general health ; gymnastic exercises to strengthen the spinal and other muscles, and to develop the chest ; rest in the recumbent position at intervals ; and re-education of the muscular sense. The last is important, for often she feels crooked in the corrected position while the wrong position appears natural to her. There is generally difficulty in ensuring that the improved position is maintained all day, and the child requires constant reminding of it ; it is a good plan to make her place herself against the wall in the corrected position for a few seconds before and after every meal.

4. **Flat Foot** also may be divided into two classes, the *postural,* in which the deformity disappears when the patient stands on his toes with the heels raised, and the *structural,* in which the deformity persists. It is commonly due to overgrowth, illness, or too much standing. The treatment consists in removing the strain on the feet, wedging up the boots along the inner side, and making the patient, when standing, turn the toes slightly in, and, when walking, keep his feet pointing straight forward. Daily exercises are sometimes ordered.

5. **Deformities of the Toes.**—*Hallux Valgus* is a displacement outwards of the big toe ; when a bursa develops on its inner side it is popularly known as a bunion. Boots with a straighter inner edge should be worn ; in severe cases removal of the head of the metatarsal may be necessary.

Hallux Rigidus is usually due to too short boots ; the metatarso-phalangeal joint of the big toe becomes enlarged, painful, and rigid. The treatment consists in raising the inner border of the boot and placing a transverse bar of indiarubber or leather across the sole just behind the joint, so that in walking the pressure is taken off it.

In *Hammer Toe* the toe is hyper-extended at the metatarso-phalangeal joint and flexed at the proximal interphalangeal joint, where a corn develops. If a corn-plaster fails to relieve the pain, the latter joint is excised.

VII. Osteomyelitis.

Acute Osteomyelitis is inflammation of the cancellous tissue, usually due to staphylococci carried by the blood. It is commonest in the tibia and femur, and between the ages of three and ten. It begins near the growing ends, at the epiphysial lines. It causes sudden and extreme pain, acute illness with pyrexia and rigors, local tenderness and swelling, and, unless relieved, pyæmia with delirium. The bone is opened and drained. Later sequestra have to be removed. Amputation is sometimes necessary.

VIII. Nursing of Children in Plaster.

Plaster bandages are sometimes applied over stockinette, in which case the moulding must be very carefully done around bony prominences, or, more usually, over wadding. Any complaint made by the child of pain over a bony point under the plaster should receive immediate attention, for it is apt to pass off as the pressure deadens sensation and the skin pressed on is killed. If complaints of pain are ignored, the development of a peculiar and offensive odour from the plaster, or of staining by discharge, may be the first evidence of a pressure sore.

Care should be taken that the casing does not get soiled or wet from urine. Jaconette or a thin layer of non-absorbent wool is useful in preventing soiling by excreta. If the child lies on a macintosh, however, the plaster will of necessity absorb urine should incontinence occur. It is necessary, therefore, to raise the spica by resting it on transverse wooden bars or by other means, the rest of the patient's trunk and his head being raised to the appropriate level by pillows. The knees, if not included in the casing, should not be allowed to become overstretched, but should be kept slightly flexed. Care should be taken in connection with the use of the bedpan, especially in girls, in whom vulvitis is liable to occur unless the utmost cleanliness is observed.

CHAPTER XXXIII.

THE NURSING OF THROAT, NOSE, EAR, AND EYE DISEASES.

1. The Throat.

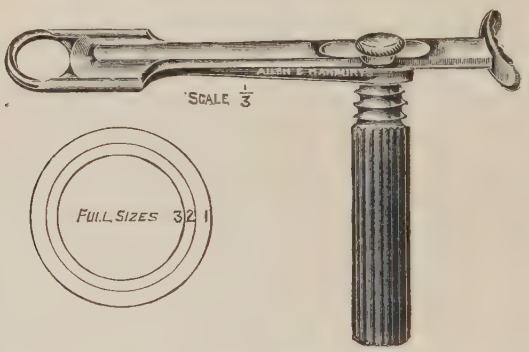
Common Diseases.—(1) **Acute Tonsillitis** may result from cold or sepsis, or may precede an attack of acute rheumatism. There may be slight superficial inflammation only, or a yellow patchy exudation from the follicles (*follicular tonsillitis*) may result; or suppuration may occur, producing a peritonsillar abscess (*quinsy*). Tonsillitis may be treated by a purgative, an antiseptic gargle, or the inhalation of steam; if pus forms, an incision is made into the most prominent part of the swelling. Sodium salicylate or chlorate of potash is often given.

(2) **Chronic Tonsillitis** may result from repeated acute attacks, or the tonsils may be chronically hypertrophied, usually in association with adenoids. Enlarged tonsils are common in children, and if they interfere with breathing or are at all septic they should be removed. In adults, septic tonsils may be the cause of chronic joint affections; they may also be liable to quinsy. The tonsil may be enucleated by the guillotine or by dissection.

(3) **Adenoids** result from a hypertrophy of the lymphoid tissue (similar to that met with in the tonsil) normally present in small amount in the roof of the naso-pharynx, above the level of the soft palate. They form soft cushion-like masses springing mainly from the roof or posterior walls, and block up the air-passage between the mouth

and nose, so that the child has to keep his mouth open. The open mouth and small nose give the child a characteristic appearance. He is liable to catarrh, and snores at night ; the development of the chest also is retarded. By overlapping the openings of the Eustachian tubes and so preventing air from entering the middle ear, adenoids may also lead to deafness and otitis media.

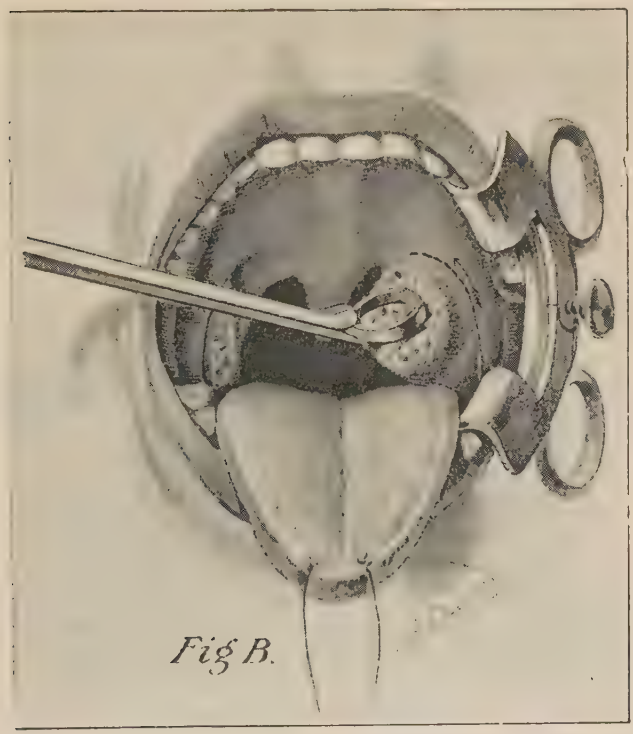
Examination of Throat.—The child should sit on a chair facing the light, and the nurse should stand behind him, holding his head between her hands with the base of her palms near his occiput, thus preventing him from both turning and receding. *In the case of a young child,* the



Heath's Tonsil Guillotine.

nurse should sit with his back and head resting against her chest, and his legs gripped between her own ; her right hand is then free to steady his forehead, while her left hand holds his arms to his sides. *If the child cannot sit up,* the nurse should place the bed so that the light will fall into his mouth. Standing behind him, she should let the back of his neck rest against the web between her left forefinger and thumb, and hold his wrists with her right hand. The doctor can then steady the child's forehead with his left hand, while he manipulates the spatula with his right hand.

Operation for the Removal of Tonsils and Adenoids.—The teeth should be put in good order prior to the operation. As a general anæsthetic—*e.g.*, ethyl chloride or ether—is needed, the usual preparation is carried out.

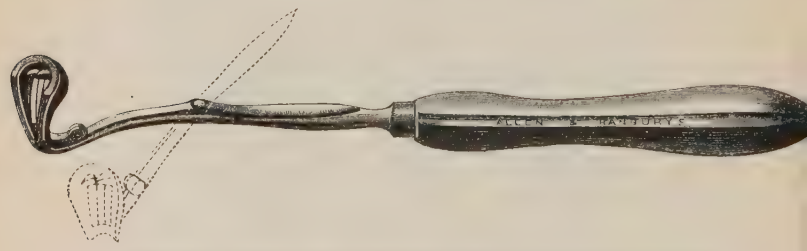


Tonsil Enucleation by dissection.
(G. E. Waugh—Surgery, Gynecology, and Obstetrics.)

The *special instruments* required are a gag, a tongue depressor, a guillotine, adenoid curettes (one with a cradle, one without), and throat sponge-holders. At the operation the patient may lie on his back with a sand-bag under the shoulders; or he may be in the semi-lateral position;

or he may sit up in a chair, the head being thrown forward between the knees as soon as the operation is completed, to prevent the blood entering the trachea and œsophagus. He should wear an indiarubber cap, to prevent the hair being soiled with blood. Some surgeons do not use a guillotine, but enucleate the tonsil by dissection under deep ether anæsthesia.

After-treatment.—The patient is placed on his side until he is fully round from the anæsthetic, to enable the blood to escape from his mouth, and should be provided with sufficient handkerchiefs to allow him to keep his nose clear. He may get up on the next day, but should not go out for several days. At first the food should be liquid, followed



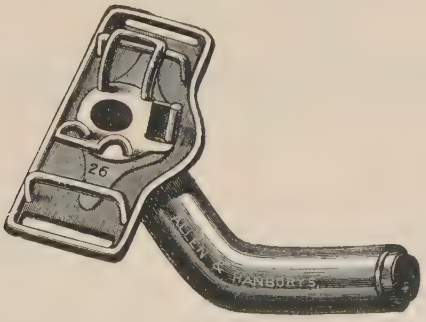
Adenoid Curette, with detachable hooks to secure the adenoid growth when removed.

later by custard, milk puddings, &c. Pain may be relieved by aspirin. Spraying the throat or gargling is sometimes ordered ; later, tonics and change of air are often advisable. Breathing exercises are most important ; the child should be taught to blow his nose, and practise breathing deeply through it for a quarter of an hour three times a day for many months, and should learn to keep his mouth shut. A bandage may be worn at night to keep the jaw up.

Complications.—Bleeding may generally be stopped by bathing the face with ice-cold water, and letting the patient sit up. Sometimes pressure has to be applied to the bleeding surface by a swab soaked in adrenalin and held in sponge-holding forceps. Occasionally the raw surface

becomes septic, and this may be followed by otitis media. If there is a purulent nasal discharge, the nose may require gentle antiseptic irrigation.

Tracheotomy is most frequently done in laryngeal diphtheria; sometimes it is called for by œdema of the glottis suddenly setting in after an operation on the throat or mouth. The *instruments required* are two knives (one broad-bladed for dissecting, the other narrow for incising the trachea), two pairs of dissecting forceps, several artery forceps, small retractors (preferably Caiger's), tracheal dilators, tracheotomy tubes with tapes attached, and laryngeal forceps. Some surgeons also use a sharp hook



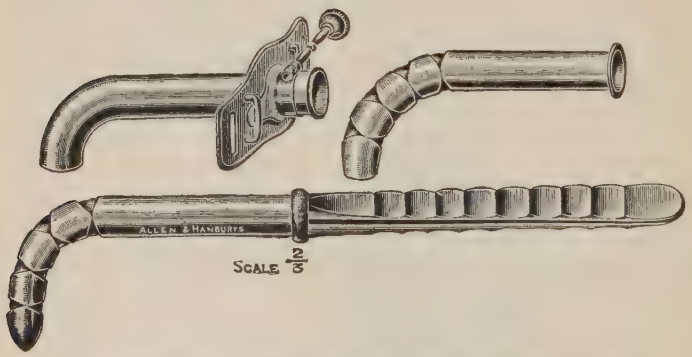
Parker's Tracheotomy Tube.

to steady the trachea. The neck should be extended over a narrow pillow or a stuffed stocking. The *tubes* usually employed are Parker's, which are bent to prevent the end rubbing on the tracheal wall; Durham's, which are adjustable in length and have a lobster-tailed inner tube and pilot; or Cubley's, which are convenient to clean. It will be noticed in each case that the inner tube is longer than the outer; this ensures that when the inner tube is removed for cleaning there is no dried mucus left at the lower opening of the outer one. (For nursing, see p. 412.)

Examination of Larynx.—The larynx is examined by artificial light, reflected from a head mirror on to a laryngeal

mirror fixed in a handle and held in front of the soft palate. The laryngeal mirror is warmed carefully by holding it above the flame of a spirit lamp. The patient protrudes the tongue as far as possible, and its tip is held, grasped firmly in a tongue cloth, by the examiner. He is told to breathe quietly.

Laryngitis.—The *acute* form may be due to cold, sudden changes of temperature, over-use of the voice, or influenza.



Durham's Tracheotomy Tube, with Pilot and Inner Tube.

The voice should be rested, the patient sent to bed, the bowels opened, and inhalations of Friar's Balsam given. *Chronic laryngitis* is commonly the result of over-use of the voice, or of chronic rhinitis or other nose trouble. *Tuberculous laryngitis* is present in 30 per cent of cases of pulmonary tuberculosis. *Syphilitic laryngitis* occurs in secondary syphilis a few weeks after infection, and also in the tertiary stage.

II. The Nose.

Examination of the Nose.—The patient sits facing the examiner, who reflects by means of a forehead mirror a strong light into the nose. The light should be placed

behind and above the patient's left shoulder. The nose may be examined from the front (*anterior rhinoscopy*) and from behind (*posterior rhinoscopy*). In anterior rhinoscopy the nares are kept open by means of Thudichum's speculum, and it may be necessary to apply a 2 per cent solution of cocaine to shrink the mucous membrane of the turbinals to allow a deeper view. In posterior rhinoscopy (the only alternative to which is examination by the finger), the smallest of the laryngoscopic mirrors is passed behind the soft palate.

Common Diseases.—(1) **Foreign Bodies,** such as beads, paper, or buttons, are not infrequently impacted in the nostrils of children, and a *unilateral* purulent nasal discharge is very suggestive of this. Removal may often be effected by syringing through the unaffected nostril while the mouth is kept open; the lotion rushes out through the affected nostril, carrying the foreign body with it. If this fails, the surgeon uses a bent probe or forceps, under an anæsthetic if necessary.

(2) **Acute Rhinitis** in the catarrhal form constitutes a "cold in the head," or nasal catarrh. It is not only due to exposure to cold, but may be caused by irritating gases, dust, and the pollen of plants (*hay-fever*). It may spread to the accessory sinuses of the nose, causing brow-ache and face-ache, or to the Eustachian tube, causing temporary deafness. In infants it may give rise to dyspnœa, and interfere with breast-feeding. Treatment consists in increasing the action of the bowels by laxatives, and of the skin by hot bath or Dover's powder, followed by bed. Sometimes relief is obtained by washing out the nasal cavities with a warm alkaline lotion containing borax, or by pouring a small teaspoonful of paraffin into each nostril. As acute rhinitis is often an infectious complaint, healthy children should be kept from close proximity to a case. An acute rhinitis may form part of an attack of diphtheria, scarlet fever, or measles. It is apt to occur frequently among those with adenoids.

(3) **Chronic Rhinitis** is commonly characterised by

enlargement of the tissues covering the inferior turbinated bone, causing obstruction to nasal respiration, and a free discharge of muco-pus. A lotion containing borax may be sniffed from the hand or applied by douche. When this fails the galvano-cautery may be used, or part of the bone may be removed.

(4) **Sinusitis** is inflammation of the accessory sinuses of the nose situated in the frontal, ethmoidal, sphenoidal, and maxillary bones. It may occur in colds in the head, influenza, pneumonia, and the infectious fevers, and gives rise to headache, pyrexia, and discharge of mucus or pus. It is treated by rest in bed, nasal inhalations, and aspirin.

Nasal Polypi are pedunculated swellings of the mucous membrane of the middle turbinal, and generally indicate disease of the bone. They are removed by a wire snare after the application of cocaine and adrenalin. If they return, a more radical operation is done.

Nasal Operations are usually performed in a darkened room, the light being reflected into the nose by a head mirror. The most common are removal of the anterior or posterior end of the inferior turbinated bone (*turbinectomy*) ; submucous resection of a deviating septum ; removal of polypi ; and drainage of the accessory sinuses of the nose (the frontal, sphenoidal, and maxillary).

The preparation consists in cleansing the face and the hairy part of the nostrils with soap and water. Local anæsthesia is usually adopted ; short pieces of ribbon gauze, moistened with equal parts of cocaine (10 per cent) and adrenalin (1 in 1000), are lightly packed in the nose an hour before the operation. After operation the nose is often plugged with sterilised vaselined ribbon gauze.

After-treatment.—If there is pain an iced cloth may be laid across the bridge of the nose. After twenty-four hours the surgeon removes the plugging, using a lamp and mirror, a nasal speculum, and forceps. The patient must not blow his nose. Occasionally an alkaline douche is used twice

daily if there is any discharge, or the nose may be sprayed with liquid paraffin.

Complications.—Shock may be severe in the very young and the old. Hæmorrhage may generally be controlled by the application of iced water to the face ; if this fails, the nose may be lightly packed with gauze moistened with hydrogen peroxide. Sepsis may give rise to infection of the accessory sinuses, the brain, or the lungs. Care must be taken that adhesions do not form between the septum and the lateral walls.

III. The Ear.

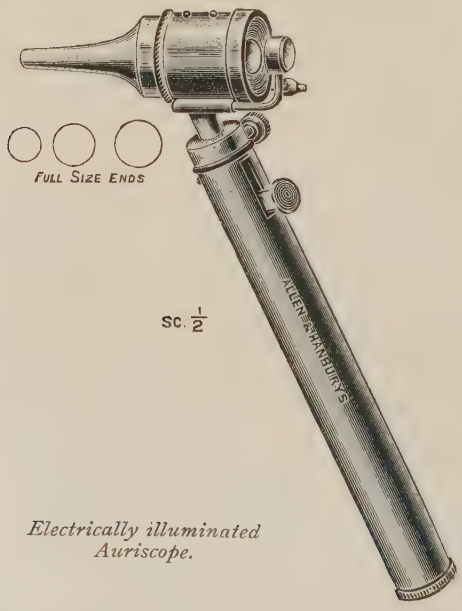
Examination of the Ear.—So often is ear disease secondary to disease of the nose or nasopharynx that it is usually necessary to examine not only the ear but the nose and throat as well. In the examination of the ear either an electric auriscope is used, or a lamp is placed slightly above and behind the patient's left shoulder, and the light is reflected by a head mirror. An ear speculum is essential, and some lotion, wooden or metal aural probes (wool is twisted on to the previously moistened end to form a slender mop), a kidney tray, and a pair of angular forceps are generally needed. A darkened room is an advantage. The ear may require syringing. The degree of deafness may be estimated by the distance at which the tick of a watch can be heard, and tone conduction tested by a tuning-fork. A Politzer bag is sometimes used in the diagnosis of a perforation of the drum-head.

Common Diseases.—(1) **Impacted Cerumen,** or wax, may block the canal and cause deafness, especially if it swells as a result of bathing. The ear should be syringed after the wax has been softened with a solution of bicarbonate of soda.

(2) **Foreign Bodies** should be removed if possible by syringing ; if this fails, the surgeon will use forceps.

(3) **Boils** may occur in the external auditory canal, and sometimes simulate more serious disease.

(4) **Otitis Media,** or inflammation of the tympanum or middle ear, may be due to catarrh of the nose or pharynx, and often occurs in measles, scarlet fever, and diphtheria ; it is frequently associated with adenoids. In acute cases *paracentesis* of the membrana tympani may be required,



Electrically illuminated Auriscope.

the drum-head being punctured by means of a fine knife to let out the inflammatory fluid which has formed in the middle ear, and so relieve the pain.

If the discharge (*otorrhœa*) does not clear up under treatment by hydrogen peroxide drops, cleanliness, ionisation, and the removal of any adenoids present, operation on the mastoid antrum is now frequently performed (p. 546). If neglected, serious complications may arise—*e.g.*, polypi,

facial paralysis, meningitis, thrombosis of the lateral sinus, and abscess in the cerebrum or cerebellum. Deafness is a common result of long-standing disease.

Politzerisation, or inflation of the tympanum with Politzer's bag, is useful in some cases of chronic catarrh, and in the diagnosis of a perforation in the drum-head. The tip of the nozzle is inserted in the nostril ; both nostrils are then compressed, and the patient told to swallow a sip of water. As he swallows, the bag is forcibly squeezed, and the air driven into the Eustachian tubes. In adults a Eustachian catheter, passed through the nostril, is sometimes used with the Politzer bag.

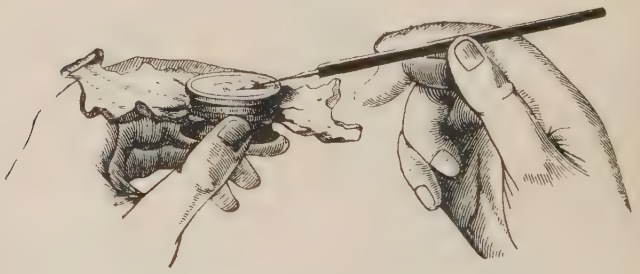
IV. The Eye.

Examination of the Eye.—This includes an examination of the lids, lachrymal apparatus, conjunctiva, cornea, iris, lens, and fundus (choroid and retina), as well as tests for glaucoma, strabismus, and errors of refraction. The room should be capable of being darkened for an investigagation of the lens, choroid, and retina, and of errors of refraction. For an examination of lids, conjunctiva, and cornea, there may be required cocaine and fluorescein eye-drops, a probe, cotton-wool, boric lotion, and kidney-tray. Test lenses, trial frame, and test types are needed in refraction tests, in addition to the ophthalmoscope and homatropine and eserine eye-drops. Homatropine is used in adults to dilate the pupil for an examination of the fundus with the ophthalmoscope. If the ophthalmoscope is not an electric one, a lamp will also be required.

Eye-drops are usually kept in variously coloured drop-bottles to aid in distinguishing one from the other. The drops are instilled by drawing down the lower lid and letting them fall on the white of the eye, not on the cornea. Those most frequently used are atropine, homatropine, euphthalmine, eserine, cocaine, adrenalin, and fluorescein. In eye operations asepsis is of even greater importance than in

other operations, for failure in this respect often means incurable blindness. Sterilisation of the drops and their container should therefore be effected by boiling. Adrenalin solution, since it does not keep well after boiling, should be so treated in small quantities only. In handling a drop-bottle after sterilisation, the rim and spout of the bottle and the lower part of the pipette should of course not be touched.

Midriatics are drugs which dilate the pupil. They must never be used unless the surgeon is satisfied that there is no danger of glaucoma being present. The most powerful is *atropine*, which has the objection that it takes five to ten days for its effects to wear away; it is very widely used in testing children for glasses. In some patients,



Kid Drum, for testing eye instruments.

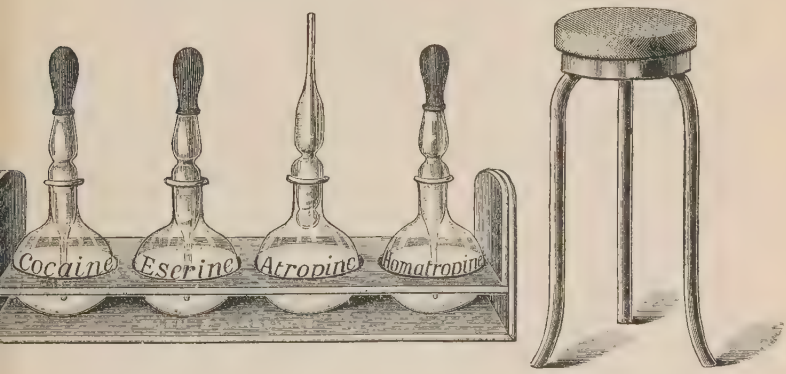
especially adults, symptoms of atropine poisoning (dry throat, giddiness, excitability, delirium) may result from the drops passing down the nasal duct into the nose, and so into the throat. This can be avoided if the drops are instilled with the patient lying on a bed, and pressure is kept on the canaliculi by the finger and thumb, placed one on each side of the bridge of the nose and as far back as possible. Atropine may be given also in an ointment. *Homatropine* is less powerful, but acts well in adults. One drop into the eye three or four times at two-minute intervals will produce the full effect in less than an hour.

Euphthalmine is similar in its action, but interferes less with the patient's powers of reading.

Meiotics are drugs which contract the pupil, *eserine* being the most powerful.

Staining is used to distinguish those areas of the cornea which have lost their surface epithelium by injury or disease. For this purpose *acriflavine* or *fluorescein* in solution is used.

Applications, &c.—*A Fomentation* (consisting of a pad of wool well wrung out after soaking in boiling water, and



Drop Bottles for sterilising and keeping ophthalmic solutions.

covered with a pad of dry wool) should be applied for ten minutes every two hours. During the ten minutes the pad should be changed at least four times. A pad of hot dry wool is then substituted, and kept on for at least half an hour.

A Cold Compress must be changed directly it ceases to feel cold. If it is allowed to remain until it becomes lukewarm, it does more harm than good. The simplest way of applying it is as follows: Two pieces of lint, each of a double thickness and suitable shape, are dipped in water, wrung partially dry, and laid on a large piece of ice standing in a strainer beside the bed. From the ice they are in turn

removed with forceps and applied to the closed eyelids. Either no bandage at all, or only one turn, should be applied to keep the compress in position.

Leeches are occasionally employed, being applied to the forehead just above the eyebrow, one at the middle and one at each end.

Blisters may be used over the forehead and temple, small areas being treated with blistering fluid or cantharides plaster. Both temples should not be treated at the same time, as this would prevent the patient resting comfortably.

Cupping the temple is sometimes adopted in acute and subacute cases of eye inflammation.

Irrigation was described on p. 136.

Ointments are applied by drawing a sterilised glass rod, dipped in the preparation, across the surface of the everted lower lid while the patient looks up. The rod should of course be resterilised before being dipped again in the ointment, and a separate one should be used for each eye.

Painting with a solution of a drug requires eversion of the lids. To evert the upper lid, let the patient lie down and look towards his feet; place a probe on the upper edge of the cartilage of the lid, and press down with it, at the same time pulling the lid margin upwards and away from the eye by means of the lashes. The upper lid being retained in position by the thumb, the lower lid is now easily everted by placing the forefinger on the skin below the eye and drawing it downwards, the patient at the same time looking upwards. The two everted lids are then pressed together, and an assistant gently wipes off any discharge with a shred of moist cotton-wool and swabs the surface with the solution, washing it away with normal saline before the lids are separated, in order to avoid irritating the sensitive cornea.

Shades, if intended to cover the eye completely, may be of pink celluloid, with a small piece of lint or wool beneath. If for the purpose of shading an inflamed eye, they should be constructed of the simplest and cheapest material Thick brown or green paper does as well as anything, a

piece of broad tape being sewn along the upper margin and tied at the back of the head. It should be large enough to cover both eyes, and should be destroyed as soon as it is soiled, never being used for more than one patient.

Buller's Shield consists of a watch-glass inserted between two squares of sticking-plaster, one a little larger than the other and each with a circular hole, the two being stuck together by their adhesive surfaces. To apply the shield, the overlapping adhesive margin is carefully fastened to nose, forehead, and cheek, but the lower part of the outer side is left open so as to admit air. The attachment to the side of the nose requires careful adjusting, and it may be necessary to add one or two extra strips of plaster in that situation. Buller's shield permits the patient to use the sound eye, while its free ventilation not only obviates inflammatory trouble, but also adds considerably to the comfort of the patient.



Buller's Shield.

An Artificial Eye is inserted by drawing the upper lid forward and pushing the glass eye, moistened with water, under it, and then pulling the lower lid downwards and forwards beneath the lower edge. It is removed by drawing the lower lid downwards while the patient looks upwards, and, having placed the tip of the finger beneath the lower border of the glass eye, pressing on the upper lid from above. A glass eye should be removed each night and washed with soap-and-water; it generally has to be renewed each year, as it tends to become rough. The

eye socket should be washed out daily with a weak antiseptic.

Common Diseases.—(1) **Of the Lids.**—*Blepharitis*, or inflammation of the margin, if unchecked, may lead to loss of the lashes. Care should be taken to clean the lid edges before applying fresh ointment night and morning. *Styes* are painful boils at the roots of the eyelashes; if they recur, the patient's refraction should be tested, as he may require glasses. *Entropion* is a turning inwards of the lid edges, often following granular lids or occurring in old age. *Ectropion* is eversion of the lids, and is most frequently due to scars from burns or lupus of the face.

(2) **Of the Lachrymal Apparatus.**—The punctum may be blocked as a result of scarring, causing the tears to run down the cheek (*epiphora*), or there may be stricture of the nasal duct following inflammation. The treatment consists in slitting up the canaliculus and dilating the nasal duct.

(3) **Of the Conjunctiva.**—All discharges from an inflamed eye should be regarded as contagious. *Catarrhal Conjunctivitis* is what is commonly called a "cold in the eye," and generally yields to treatment by lotions. *Phlyctenular Conjunctivitis* is characterised by the formation of one or more yellowish pustules near the corneal margin. *Purulent Ophthalmia* is a very dangerous form of conjunctivitis, and is usually due to gonorrheal infection. In newborn children (p. 463), it often affects both eyes; in adults, generally only one. If only one eye is affected, the other may be protected by the application of a Buller shield. Paper splints should be placed round the elbows of young patients, especially when one eye only is affected. Frequent irrigation is usually ordered. In *Granular Ophthalmia*, or *Trachoma*, granulations resembling sago grains appear on the surface of the conjunctiva lining the lids; it is difficult to cure, and often leads to marked impairment of sight. In *Diphtheritic Conjunctivitis* membrane forms on the inflamed surface.

A nurse in charge of a case of purulent, diphtheritic, or

granular ophthalmia, should keep her nails closely pared, and use the nail-brush diligently after attending to the patient; she should remove all applications with dressing-forceps, and not with the fingers; she should not take an affected child into the arms if it can be avoided, and should stand behind the patient when using remedies; she should never use a syringe, and should protect herself by wearing goggles, macintosh apron, and sleeve-guards.

(4) **Of the Cornea.**—*Keratitis*, or inflammation of the cornea, may follow conjunctivitis or injury. *Interstitial keratitis* is an inflammation of the deeper layers due to inherited syphilis, and generally occurs between the ages of five and fifteen. *Ulceration* may result from abrasion or debility, or follow conjunctivitis; little pustules (*phlyctenules*) may be present, and sometimes pus forms in the anterior chamber (*hypopyon*). *Opacities* are caused by previous inflammation or ulceration; if very slight, they are called "nebulæ"; if moderately dense, "maculæ"; if very dense, "leucomata." Corneal inflammation and ulceration are treated by rest and the use of atropine, local applications, and constitutional treatment.

(5) **Iritis** gives rise to pain, photophobia, a change in colour and loss of distinctness of the pattern of the iris, a sluggish and contracted pupil, and a pink belt of congestion round the cornea (*ciliary injection*). It may be due to syphilis, gonorrhœa, or sepsis. It is treated by atropine drops, fomentations, leeches, rest, and protection from light. The cause also requires treatment.

(6) **Glaucoma** is a condition in which the hardness of the eyeball is increased. It usually occurs between the ages of fifty and sixty, is more common in females, and may be hereditary. Atropine drops may bring on an attack in a predisposed person. In some cases glaucoma may produce merely a gradual failure of vision; in others the eye is inflamed and the cornea steamy, the iris lies near the cornea, the pupil is dilated, and the eyeball feels hard The patient may see rainbows round lights, and complain of pain in the globe and neuralgia of the face. Mild cases are treated

by rest and eserine drops. In severe cases *iridectomy* (excision of a portion of the iris) is often called for.

(7) **Cataract** is a clouding of the lens, and may be complete or partial. Rarely it may occur in the new-born (*congenital*) or young people (*juvenile*), but it is much more common in adults after middle age (*senile*). The treatment consists in removal of the opaque lens. In a young person the cataract is *needled* to effect this; the aqueous fluid finds its way into the lens substance, which will then swell up and eventually become absorbed, leaving a clear pupil for the patient to see through. In senile cataract this operation might cause glaucoma, so in elderly patients the lens is extracted through an incision made along the edge of the cornea, iridectomy being generally done at the same time.

(8) **Errors of Refraction.**—*Emmetropia* means normal refraction, the patient requiring no help from glasses. *Myopia* is "short-sight"; the person can see to read without difficulty, but cannot see objects clearly in the distance; it is treated by means of minus or concave spheres. In *hypermetropia* the trouble is with the reading sight rather than with distance vision. *Presbyopia* is "old-sight"; it begins in the emmetropic between the ages of forty and forty-five, but affects the hypermetropic earlier and the myopic later than this. Hypermetropia and presbyopia are both treated by plus or convex spheres. *Astigmatism* exists when the different meridians of the eye are of unequal focussing power; it is treated by cylinders, either plus or minus.

(9) **Strabismus,** or *squint*, may be the result of paralysis of an eye muscle, in which case the patient generally sees double (*diplopia*), or to the over-action of certain of the eye-muscles as a consequence of the error in the refraction of the eye. The latter is treated by glasses, but if the squint does not improve it may require an operation on the muscles —*e.g.*, tenotomy, or tendon lengthening or advancement.

Operations.—In the *preparation* of a patient for any operation on the eye, the face and eyelids should be thor-

oughly washed the night before, and again an hour before operation, when the conjunctival sac should be washed out with perchloride of mercury solution (1 in 6000), the eyelids being everted for the purpose. Immediately before operation, it should be douched again with boric lotion. Many surgeons have the upper eyelashes cut quite short. In squint operations a general anæsthetic is often administered, but most intraocular operations (*e.g.*, iridectomy, removal of cataract) are performed under local anæsthesia to avoid the risk of the straining which would accompany vomiting. In such cases a few drops of a 2 per cent sterile solution of cocaine are instilled about thirty minutes before operation, and repeated at intervals of five minutes. Sometimes cocaine is injected under the conjunctiva, and twilight sleep (p. 521) may be used to quiet nervous patients.

After-treatment.—The room should be kept quiet, and darkened by drawing the blinds; a bell should be placed near the patient, who at first must not be allowed to speak more than a few words. He should lie on his back for several hours with a pillow under the knees, aspirin being given if there is much pain. He should be told not to cough or strain in any way; and warned to arrest a sneeze by pressing on the centre of the upper lip with his finger. A hypnotic may be required the first night. Lest in his sleep he should rub his eye, it is advisable to tie his hands to a waist-belt, or a protective eye-shield may be worn. During the first twenty-four hours the diet should be fluid; then a light diet may be given, followed by a solid one when the bowels have been opened. The eye is dressed after twenty-four hours, and the lids cleansed; if there is any discharge argyrol drops (10 per cent) are instilled. Atropine is usually inserted daily. In cataract cases the unoperated eye may be uncovered on the third day, and both eyes on the sixth. If there is any delirium, the unoperated eye should be uncovered at once. On the third day the patient may be propped up in bed for short periods, and a mild purgative may then be given. On the fourth day he may get up in a chair, and two days later walk a

few steps in the room. Old patients may have to be sat up from the first.

After squint operations, both eyes should be covered with pads for four or five days to keep them at absolute rest until union has taken place. Atropine is usually ordered to be instilled. The stitches are removed under cocaine after a week or ten days. If there is infection of the conjunctiva, irrigation may be required. The patient should wear glasses to correct any error of refraction.

Complications.—Intraocular hæmorrhage may occur, and cause the contents of the eyeball to be extruded. Similarly, vomiting or straining after a cataract operation may cause the vitreous humour to escape, and the eyeball to collapse. Sepsis may rapidly destroy the eyeball (*panophthalmitis*) or slowly disorganise it, sometimes causing *sympathetic ophthalmia* in the other eye. Delirium may occur in old or alcoholic patients.

Eye Instruments.—A spring speculum is employed to keep the eyelids open, fixation forceps to fix the eyeball, and iris forceps to seize the iris. Special knives are used for the various operations—*e.g.*, the cataract, the iridectomy, and the canaliculus knife; similarly, there are special iris and capsular forceps and scissors. The strabismus hook serves to pick up the tendon in squint operations, and the corneal spud to remove foreign bodies from the cornea.



Electrically illuminated Ophthalmoscope.

CHAPTER XXXIV.

MASSAGE, EXERCISES, AND MEDICAL ELECTRICITY.

I. Massage.

General Principles.—The aim of massage is the restoration of function. It acts in two ways—reflexly and mechanically.

(1) *The reflex effect* is well seen in the treatment of a recent fracture by light stroking. In a comminuted fracture of the neck of the humerus, for example, there is very severe pain, and the arm is thicker and shorter than its fellow as a result of spasm. Under very gentle massage the pain gradually disappears, and then the arm slowly becomes longer and more slender as the spasm passes off, until there is practically no difference to be observed between the limbs. Similarly, when massage is employed in the treatment of neurasthenia, insomnia, and other nervous affections, the relief which occurs depends almost entirely on the reflex response. In abdominal massage, also, reflex stimulation plays a very important part.

(2) *The Mechanical Effect.*—Massage movements can exert a mechanical effect in the following ways: (*a*) by assisting the flow of lymph; (*b*) by aiding the circulation, and so hastening the removal of waste products; (*c*) by stretching any adherent or contracted structures; and (*d*) by pressure on the abdominal organs.

The Movements of Massage.—These fall under three

main heads—stroking movements, compression movements, and percussion movements.

(1) *Stroking movements* may be superficial or deep. Superficial stroking aims at a reflex effect only; it should be gentle, slow, and regular. Deep stroking (also called "effleurage") should be in the direction of the venous flow, as in all deep massage, and the movements should be slow. It is intended to produce the mechanical effects which are detailed above, but it may have also some reflex effect—*e.g.*, an increase in the peristaltic movement of the intestines. While the treatment is being carried out, the part must be in a state of perfect relaxation. In each case the proximal segment of a limb should be massaged before the distal part.

(2) *Compression movements* include friction and kneading ("petrissage"). In *friction* the muscles are rubbed circularly by the finger-tips against the deeper structures; it is of special value in breaking down adhesions, and in hastening absorption in cases of œdema. *Kneading* is performed with the palms of the two hands placed on opposite sides of the limb; gentle pressure is exerted and a circular movement performed, the hands usually working in opposite directions.

(3) *Percussion*, or "tapotement," consists in administering a series of blows to the part, the two hands working alternately. It is used to stimulate muscles and relieve congestion, but should never be adopted in cases of spasm, or over sensitive areas, or over any paralysed muscle until its contractibility has been restored. There are three varieties—hacking, clapping, and beating. *Hacking* may be performed with the ulnar border of the little finger, supplemented successively by the other fingers; or, if deeper or more vigorous action is desired, by the ulnar border of the whole hand. In *clapping*, the hands are hollowed out, and the fingers extended. In *beating*, the fist is half-closed and the ulnar border is used.

General Points.—The patient should be in a comfortable position so that all his muscles are relaxed, and

only the part under treatment should be exposed. The room should be warm, and the limb should be placed on a blanket. If the skin is moist, a dusting powder should be applied. The treatment usually lasts ten to twenty minutes, except in "general" massage, which takes nearly three-quarters of an hour.

II. Movements.

Massage alone rarely suffices to secure restoration of function. *Re-education in movement* is also required. For this purpose two kinds of movement are used—passive and active.

(1) **Passive Movement** aims at keeping the joints supple, preventing the formation of adhesions, hastening repair, improving the circulation of blood and lymph, and maintaining the elasticity of the muscles.

The movements should be frequently repeated, and each should be only very slightly greater than the one that preceded it. The patient must co-operate by relaxing completely the part which is being moved, and the masseuse must support the joint in such a way that the patient has a feeling of security and ease. In any movement of the lower limb the knee should be kept slightly flexed.

(2) **Active Movements** may be divided into free movement, assistive movement, and resistive movement.

Very few movements are naturally *free*, gravity usually either assisting (*e.g.*, in adduction of the arm) or opposing (*e.g.*, in abduction of the arm). This influence may be largely eliminated, and movement thus *assisted*, by the use of a weight and pulley, or by position (*e.g.*, the patient may be placed on his back or on his side), or by immersion in hot water.

Resistance may be applied in two ways: a movement may be performed by the masseuse, while the patient resists ("excentric"); or by the patient, while the masseuse resists ("concentric"). The former should not be

used in the early stages of recovery from paralysis, because it tends to stretch the muscle, but the concentric movement is useful in all stages. Instead of the resistance of the masseuse, that of gravity may be utilised if the position of the patient's limb is suitably arranged.

The Nauheim Treatment is used to increase the tone and power of the heart in certain forms of cardiac disease. The patient takes a hot effervescing saline bath, and, after resting on a couch for half an hour, is massaged and put through movements against resistance, which is gradually increased from day to day. An artificial Nauheim bath can be made by using Sandow's powders and tablets.

The Schott Treatment, adopted in some cases of disease of the heart, consists of regulated exercises, resistance to the movements being made by the nurse. The movements should be slow, and last only about half a minute each, the total amounting to about half an hour daily. If dyspnœa occurs, or the pulse becomes more rapid, the resistance should be lessened or the exercises stopped.

III. Medical Electricity.

Currents.—Electricity may be produced in various ways, particularly by *chemical action,* as in dry cells, and by *induction,* as in the induction coil and on a large scale at electric power-stations. The electricity which is obtained from the main may be a direct or an alternating current according to the locality.

(1) *The direct current,* known in medical work as the "constant" or "galvanic" current, is a simple current flowing continuously in one direction and at a constant strength.

(2) *An induced or faradic current* is the interrupted current which is induced in the long fine wire of the secondary winding of an induction coil when the galvanic current, passing through the shorter thicker wire of the primary winding, is automatically "made" or "broken" (*i.e.,*

allowed to pass or interrupted) in rapid succession by means of a vibrating spring or "hammer."

(3) *The alternating current,* "sinusoidal" current as it is



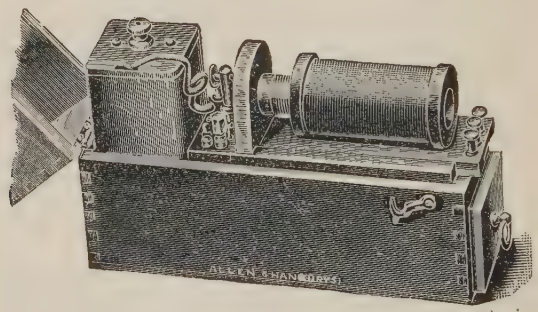
Constant Current Battery, fitted with dry cells and milliampere-meter, for ionisation, electrolysis, and galvanisation.

called in medical electricity, is a current which rises from zero and falls again, then reverses its direction and repeats the rise and fall in the opposite direction. The frequency of the alternations is very commonly about fifty per second.

Applied to the skin, it is apt to be more painful than a faradic current.

(4) *A high-frequency current* is an alternating current in which the alternations take place at a much greater rate, even up to a million times a second.

A galvanic current may be obtained through a switchboard from the electric main if this supplies a direct current; otherwise a battery of dry cells is used. The amount of current passing is measured by a galvanometer. Similarly, a *sinusoidal current* can be obtained from the main if this supplies an alternating current. A *faradic current* is derived from a faradic battery, consisting of an induc-



Sledge Coil for faradisation, fitted with one large dry cell.

tion coil with dry cells or accumulators to supply the galvanic current needed for the primary winding. *High-frequency currents* are obtained from a special apparatus.

Meaning of Terms commonly used.—The pressure of electricity, or the driving force which causes it to move, is known as "electro-motive force"; it is measured by means of a volt-meter, a *volt* being the unit of this force.

The volume of current which is driven through by the pressure of this force is measured in amperes, an *ampere* being the unit of current. In medical electricity the amount of current used is much less than an ampere, and the *milliampere*, or one-thousandth part of an ampere, serves

as the unit; the galvanometer used in its measurement is called a milliampere-meter.

The terminals of a battery are known as the "poles," the positive pole being called the *anode*, and the negative the *kathode*. These terminals are connected, by wires coated with insulating material (*rheophores*), with pads made of metal covered with chamois leather (*electrodes*), which are placed in contact with the patient's skin. The small disc or roller electrode placed over the affected area is known as the "active" electrode, and the large well-padded one placed under the patient's back to complete the circuit as the "indifferent" electrode.



Roller Electrode.

Method of Application.—The patient should lie on a couch or sit in a chair, with the part to be treated resting on a towel. Both electrodes should be kept well wetted with saline solution and held firmly against the skin, which also should be wetted to enable the current to pass freely. When both electrodes are stationary, the application is said to be *stabile;* when one is moved over the surface it is termed *labile*. The latter is required in faradism, and also in galvanism applied for paralysis. When used to allay pain, galvanism should be stabile. Rhythmical breaking of a galvanic current may be effected by a metronome, or clockwork interrupter, fitted with wires which dip alternately into two cups of mercury.

Therapeutic Uses of Electric Currents.—(1) *The constant current*, if allowed to flow continuously, influences chiefly the *general metabolism*. The nutrition of the tissues is improved and healing is hastened; the nerves are improved in tone, and pains due to lowered vitality disappear. These effects are produced without contractions of the muscles, for the constant current does not cause muscle to contract unless it is suddenly made or broken.

If it is desired to produce contractions with a view to exercising and so *developing a muscle*, it is necessary to interrupt the flow of the current or vary its intensity repeatedly. This may be done by (*a*) the labile method with a movable electrode; (*b*) a reversing switch; or (*c*) a clockwork interrupter. To get the best effect, the active electrode must be placed on the "motor point" of each affected muscle. The motor point is the spot at which the nerve enters the muscle, generally about its middle.

Galvanism is used in ionic medication (the introduction of drugs through the skin); in the electrolysis of warts and nævi; to promote the absorption of inflammatory products, as in adhesions after injury; to exercise paralysed muscles in which the reaction of degeneration exists; to relieve pain in neuritis, neuralgia, or lumbago; and in the treatment of chilblains, neurasthenia, debility, &c.

(2) *The faradic current* acts on muscles through the nerves only. When the latter are degenerated, the muscles fail to contract to this form of stimulation. If both nerve and muscle are healthy, the electrical impulse acts in the same way as a nervous impulse. As a consequence, the muscular contractions set up by faradism improve the circulation and the general metabolism, and also strengthen the muscles stimulated. This last effect is of special importance in the case of involuntary muscle, such as that present in the walls of the alimentary canal.

The stabile method is only used for the relief of chronic pains, not for muscle stimulation, for it would tetanise and exhaust the muscle.

Muscle stimulation may be effected by (*a*) firmly bandaging the indifferent electrode over a superficial part of the nerve which supplies the affected muscle, and either moving a roller electrode over the latter or applying a disc electrode to its motor point; (*b*) bandaging on two large electrodes, and rhythmically increasing and decreasing the current by regularly inserting and withdrawing the core of the induction coil ("surging" faradism); (*c*) bandaging on large pads and using a rhythmic interrupter

in the circuit so timed (*e.g.*, one interruption a second) as to avoid a tetanising effect ; and (*d*) by means of arm and leg baths (Schnee four-cell bath).

Faradism is used for the relief of pain in headache and neuralgia ; for muscular weakness following injury or disuse ; for paralysis, if the reaction of degeneration is not present ; and for neurasthenia, debility, &c.

(3) *The sinusoidal current* is used for muscle stimulation ; also in neurasthenia, hysteria, neuritis, chilblains, rickets, &c.

(4) *The high-frequency current* is exhilarating and produces a feeling of glowing warmth, the treatment depending chiefly on the production of heat. It is used in neuritis, neuralgia, and other nervous affections ; also to hasten the healing of wounds and ulcers.

The Diathermy apparatus has been designed to make full use of the thermal effect of this current. Since the heat is produced all along the course of the current as it passes through the body, it is possible to concentrate heat on parts which are too deeply seated to be affected by the application of external heat. It is employed in the relief of pain of all kinds, and in the treatment of scars, adhesions, and stiff joints. Use is also made of the intense heat that can be produced by it in the treatment of some cases of cancer—*e.g.*, of the tongue,—the diseased part being burnt off under an anæsthetic.

Uses in Diagnosis.—The nutrition and tone of a muscle fibre depend on nervous impulses from the motor nerve-cells in the anterior horn of the spinal cord. If by injury or disease of the nerve or nerve-cell these impulses are cut off from the muscle, the latter soon degenerates. It is paralysed and wastes rapidly ; it loses its tone and becomes flabby ; the circulation through it is defective and the part is cold. Such a condition is seen in infantile paralysis.

When this condition exists, the muscle responds abnormally to electrical stimulation, this abnormal response being known as *the reaction of degeneration*, usually written shortly as R.D. The chief features of the reaction are :

there is complete loss of excitability of both nerve and muscle to the faradic current; the muscle continues to respond to stimulation by the continuous current, but its contraction is sluggish; and sometimes the contraction is more easily obtained by using the anode as the active electrode, instead of, as normally, the kathode.

Other Uses of Electricity.—(1) *Radiant heat and light baths* may be given to the body or limb by means of carbon-filament lamps, suspended in a cabinet or metal cradle of suitable size.

(2) *The Finsen and Kromayer lamps* are used in the treatment of lupus. The ultra-violet rays which are produced are concentrated on the diseased tissues, the blood from which has to be removed by the pressure of a quartz compressor because the rays will not pass through blood. The nurse's eyes are protected by dark glasses.

(3) *Carbon-arc and mercury vapour lamps* are used for rickets and non-pulmonary tuberculosis when direct sunlight is not available. Exposures, gradually increased to 60 min. for the arc and 20 min. for the other lamp, are given, the nude patients wearing dark glasses.

(4) *X-rays* are used in the investigation of injuries and diseases of bones and joints, in the detection of foreign bodies and calculi, and in the diagnosis of pleural effusion and other chest abnormalities. Certain abnormal conditions of the stomach and intestines can be recognised by X-raying after the administration of a bismuth or barium meal (p. 159). If an abdominal organ is to be X-rayed, the patient should be given castor-oil on the preceding evening, followed by an enema in the morning.

Recently X-rays have been employed in the diagnosis of diseases of several other organs.

(*a*) *Gall-bladder.*—Cholecystography, as it is called, is used when the presence of gall-stones or other affection of the gall-bladder or cystic duct is suspected. A salt, tetra-iodo-phenol-phthalein, is given (intravenously, or orally in a capsule), and X-ray films made after twelve hours, and again six hours later after a meal containing fats. Castor

oil should have been given twenty-four hours before. The salt, which is opaque to X-rays, is excreted in the bile.

(*b*) *Ureter and Kidney.*—By means of a cystoscope and ureteric catheter, sodium bromide solution is injected into the ureter, filling it and the renal pelvis. Being opaque to X-rays, it produces a shadow on the X-ray film. This is useful in the diagnosis of dilatation of the renal pelvis and stones in the kidney and ureter.

(*c*) *Bronchi.*—Another solution, opaque to X-rays, is lipiodol. This is injected into the trachea by a needle passed through the crico-thyroid membrane, and allowed to trickle into one bronchus. An X-ray reveals any dilatation of the bronchus ; this is useful in bronchiectasis.

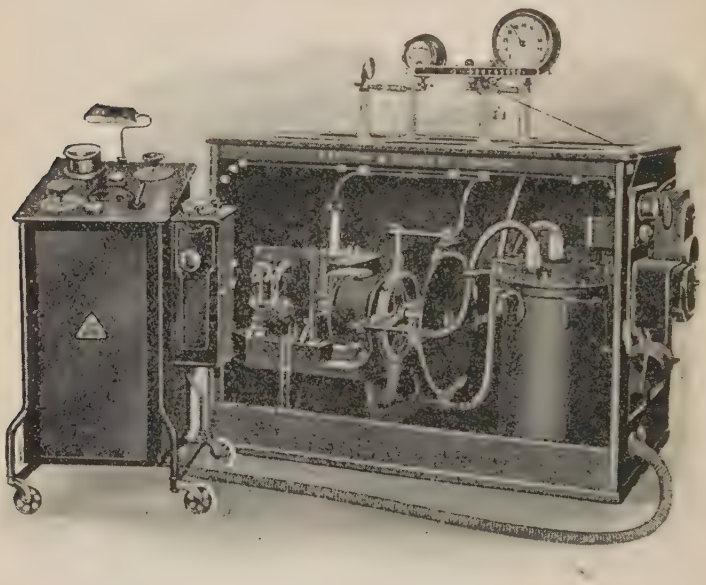
(*d*) *Spinal Cord.* — In spinal compression, lipiodol is injected into the cerebro-spinal canal at the level of the base of the skull, with the patient sitting. After half an hour he is X-rayed erect, and the distance to which the lipiodol has fallen is seen.

X-rays are also used in *treatment,* particularly of ringworm of the scalp and malignant diseases. If the nurse has to hold the patient, her hands should be protected by special opaque gloves.

At the present time X-rays are regarded as *the* treatment for *ringworm of the scalp.* They act, not by killing the ringworm fungus, but by so affecting the delicate cells of the hair papillæ that all the hairs fall out on that part of the scalp which is acted upon by the rays. This begins to occur about two or three weeks after the treatment has been carried out, and by the end of the fourth week the area so treated is quite bald and the patient cured. This is very much more rapid than any of the old methods of treatment, and far more certain. New hair does not begin to appear for about two months.

It is very important when using these rays not to give an overdose, otherwise severe burning results, which heals with great difficulty. To prevent this a *pastille,* invented by a French physician named Sabouraud, is used when diseases of the skin are treated. This pastille, which is

made of a preparation of barium, is of a green colour. After exposure for a certain time to X-rays it becomes yellow. Before treatment is commenced, one of these pastilles is placed midway between the centre of the tube and the skin so that it receives the full force of the rays. As soon as it has changed from green to yellow the operator knows that the patient has received a sufficient



"Snook" Transformer X-ray Apparatus.

dose of the rays, a continuance of the treatment being accompanied by danger of burning. A standard pastille of the required tint of yellow is supplied for comparison with the one that is being used, which is removed occasionally to see if the necessary change has taken place in it. This should be done as quickly as possible, since daylight changes the colour back to green again.

Radium, since it is often used in the treatment of

certain diseases in the place of X-rays, may be briefly referred to at this point. It was discovered in 1898 by Madame Curie in Paris, and is obtained commercially from various uranium ores. It emits three kinds of rays, known as alpha, beta, and gamma rays, but gives them off so slowly that its half-life period is stated to be 1700 years. The *alpha rays* have no therapeutic value. The *beta rays* are absorbed by the skin, and are thus used for the destruction of superficial growths. The *gamma rays* are fewer but more penetrating, resembling a very penetrating X-ray. They are, therefore, the ones used when deeper structures, such as tuberculous glands, have to be treated, the other rays being arrested by a screen formed of a piece of silver and several layers of paper and lint, placed between the radium applicator and the skin. The gamma rays are also useful in reducing thick (keloid) scars.

Radium may be applied in the form of a radium salt imbedded in a glazed applicator, which can be fixed to the skin over the part by adhesive strapping, as in the treatment of tuberculous glands ; or as a radium " emanation " enclosed in tubes, which can be inserted into a growth.

Ultra-violet Light in Diagnosis.—If a piece of Wood's glass is placed in front of a Kromayer or other mercury vapour lamp, it allows only rays of a certain wave length to pass, and these rays have the power of exciting fluorescence in hair infected with *ringworm*. If the scalp is thus examined in a darkened room, the infected hairs present a striking contrast with the rest. The method, therefore, is of value for the detection of early cases in infected schools and institutions, and for the purpose of certifying a cure.

PART VII.—GYNÆCOLOGY AND MIDWIFERY.

CHAPTER XXXV.

GYNÆCOLOGY.

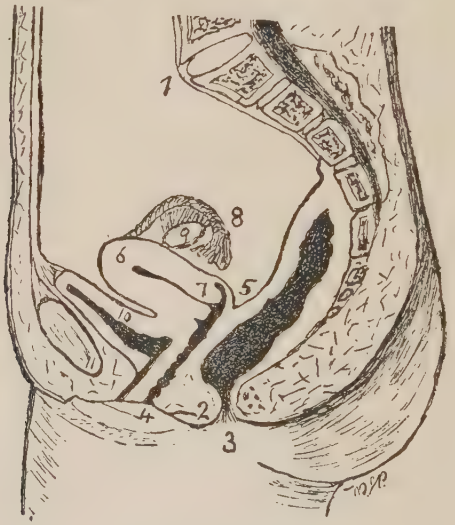
I. Anatomy.

The Pelvis is made up of four bones, the two ossa innominata, the sacrum, and the coccyx; during pregnancy the mobility of the joints between these bones, which ordinarily is very little, is considerably increased. Its cavity is divided into an upper and a lower half by the *pelvic brim*, formed by the upper margin of the pubes in front and the promontory of the sacrum behind. The brim is the part of the bony canal where deformities most frequently exist, and where impediment to labour most commonly occurs. Its antero-posterior diameter (or "conjugate") is the smallest measurement, and therefore the most important; it is normally $4\frac{1}{4}$ inches.

The female generative organs are the uterus and its appendages, the vagina, and the vulva. The skin between the latter and the rectum is called the *perineum*, which forms the base of the *perineal body*, a pyramidal structure of connective tissue, blood-vessels, and muscle, lying between the lowest inch of the vagina and the rectum. The perineal body is stretched, and may be torn, during childbirth; and injury to it favours prolapse, or falling, of the

uterus, since it forms an important part of the pelvic floor.

The Vagina lies between the bladder and the rectum; its anterior wall is two and a half inches long, and its posterior wall an inch longer. The uppermost inch of the posterior wall lies close to *Douglas's pouch*, which is the



Section of the Female Pelvis.

1. Promontory of the sacrum. 2. Perineal body. 3. Anus. 4. Vaginal orifice. 5. Pouch of Douglas. 6. Body of the uterus. 7. Posterior lip of cervix. 8. Fallopian tube. 9. Ovary. 10. Bladder. 11. Symphysis pubis.

name given to the lowest part of the peritoneal cavity. The direction of the vagina—viz., upwards and backwards —should be remembered when giving a vaginal douche.

The Uterus is a pear-shaped muscular tube, about three inches long, two inches broad, and one inch thick, covered with peritoneum and lined with a mucous membrane, called the *endometrium*. The upper part is termed the *body*, and the lower part the *cervix*, or neck. The cavity

of the body is one and a half inch long, and into its upper and outer angles open the two Fallopian tubes. The canal of the cervix is an inch long, and opens into the vagina through an aperture called the *os uteri*. The uterus normally is in a position of "anteversion"—*i.e.*, leaning forwards. It is kept in position by eight folds of peritoneum, or *ligaments*. The two folds which pass between the uterus and the sides of the pelvis, and keep it in its central position, are called "broad ligaments," and the two which attach it to the abdominal wall are termed the "round ligaments."

The Fallopian Tubes are about four and a half inches long, and run in the broad ligaments. The inner end of each leads into the cavity of the uterus, while the other end opens by a trumpet-shaped aperture into the peritoneal cavity. There is thus a direct passage possible for the spread of inflammation from the vulva and vagina into the peritoneal cavity in cases of infection by sepsis or gonorrhœa.

The Ovaries are of the shape and size of an unshelled almond, and lie one beneath each Fallopian tube, supported by a fold of peritoneum.

II. Physiology.

Each ovary consists of a framework of connective tissue containing *Graafian follicles*. These are round masses of cells, one of which is an *ovum*, or egg-cell, so small that a hundred of them lying side by side would only cover an inch. As the Graafian follicles ripen, they rupture on the surface of the ovary and discharge the ova, which pass through the Fallopian tube into the uterus; this is known as **Ovulation**. Each month, unless fertilisation occurs, the greater part of the mucous membrance of the uterus breaks down, and, together with the ovum, escapes with the menstrual discharge.

Puberty is the time, usually about the age of fourteen,

when the ovaries and uterus first become active, and ovulation and menstruation commence.

Menstruation is the discharge of blood, mucus, and shreds of mucous membrane from the uterus, which recurs usually once a month, generally twenty-eight days from the beginning of the previous period. The blood is derived from a rupture of small blood-vessels in the endometrium, which separates part of its superficial layer in the form of shreds; the mucus comes from the uterine glands. Some women menstruate every three weeks, others every five. The flow lasts usually from three to six days, and the quantity of blood lost is on an average five ounces. The discharge is dark red, and free from clots unless the loss is excessive. It is accompanied in many women by depression, headache, backache, tenderness of the breasts, and nausea. Menstruation ceases in pregnancy, and when the ovaries are removed or destroyed by disease; generally it does not occur during lactation.

Conception.—Fertilisation occurs when the male cell, or *spermatozoon*, passes by its own movements from the vagina through the uterus into the Fallopian tube, where it penetrates the ovum and thus fertilises it. The fertilised ovum descends into the uterus, and burrows in a fold of the endometrium, which is now called the "decidua." It then commences to grow, and develops at one end little thread-like processes, called "chorionic villi," which form the fœtal part of the *placenta*. The adjacent decidua also undergoes development, and forms the maternal part of the placenta. The two parts become so closely interlocked that interchange of gases, and of nutritive and excretory material, can take place between them. The ovum grows into a "fœtus," and through the placenta, by means of the umbilical cord (*funis*), the child is nourished until it is born. The fœtus is enclosed in a double bag of membranes. The *chorion*, the outer bag, is continuous with the maternal part of the placenta; the *amnion*, the inner bag, with the fœtal part. The latter at full time contains from one to two pints of "liquor amnii." From

the fifth month onwards the skin is covered with a white greasy substance, the "vernix caseosa."

Occasionally, without known cause, the fertilised ovum does not get into the uterus, but develops in the Fallopian tube, producing the dangerous condition of "tubal pregnancy."

The Menopause, or "change of life," occurs most frequently between the ages of forty-eight and fifty, and is generally associated with irregularity, both in the amount lost and in the interval between the periods; these may be less or greater. It is accompanied often by flushing, nausea, constipation, headache, depression, neuralgia, or backache. It occurs at a time when cancer is most common, and the symptoms due to the latter are often ascribed to the menopause, with a result that medical advice is not taken until too late for successful operative interference.

III. Disturbances of Menstruation.

1. **Amenorrhœa** is absence of menstruation in a person of suitable age. The commonest cause of amenorrhœa *gradually* coming on is anæmia, whereas if it occurs *suddenly* in a person who has previously been regular, it is usually due to pregnancy. Occasionally it is due to psychic influence, such as grief or fear of pregnancy. Rarely there is a congenital malformation, such as an *imperforate hymen,* which causes obstruction, and the menstrual discharge is retained. The treatment in each case is the treatment of the cause.

2. **Menorrhagia** is a menstrual flow which is more than usual. It is usually a sign of *congestion,* resulting from constipation, abdominal tumours, liver or kidney disease, alcohol, or over-exertion. It may also be associated with the irregularity which often occurs at puberty and at the menopause.

3. **Metrorrhagia** is hæmorrhage from the genital organs in the interval between the periods, and may be accom-

panied by menorrhagia. It may be caused by ulceration of the vulva, vagina, or cervix (malignant, tuberculous, or syphilitic), or by misplacement or inversion or subinvolution of the uterus, or by uterine tumours (malignant growth, fibroid, or polypus), or by inflammation of the parts (endometritis, salpingitis, parametritis, perimetritis), or by a neglected pessary. The treatment is again that of the cause, and early examination by a medical man is essential lest the cause be cancer.

4. **Dysmenorrhœa** is pain before or during menstruation. Nearly three out of every four women have some pain in association with their periods, but only in the minority is it severe. When the pain is intermittent, it is described as colicky dysmenorrhœa; when continuous, congestive dysmenorrhœa.

(*a*) *Colicky dysmenorrhœa* may have no cause, and is then known as "spasmodic" dysmenorrhœa, which is the commonest form in young girls, appearing as the flow begins and lasting about a day. In other cases it is due to the uterus expelling some substance, such as blood-clot (formed in excessive flow), large pieces of mucous membrane ("membranous" dysmenorrhœa), or a polypus.

(*b*) *Congestive dysmenorrhœa*, or pain associated with the congestion of the genital organs which normally precedes menstruation, is common in young women without obvious cause. In others the pain is due to the fact that there is present a chronic inflammation (endometritis, salpingitis, parametritis, perimetritis), or congestion resulting from fibroids or displacement of the uterus.

Treatment depends on the cause, and may be by rest, hot applications to the lower abdomen, drugs (saline aperients, tonics, antipyrin, and the like), or operation (dilatation of the cervical canal). Opiates should on no account be given, nor should alcohol be recommended. Some, who believe that dysmenorrhea is often due to a deficiency of secretion of one or more of the ductless glands, claim good results from the administration of glandular preparations.

IV. Leucorrhœa.

Leucorrhœa, generally known as "the whites," is the term applied to most discharges which are not blood-stained. A slight mucous secretion normally flows from the lining of the Fallopian tubes, uterus, cervix, and vagina. Catarrh of the genital as of any mucous membrane is not uncommon, and often disappears in a few days without any treatment, but in weakly women it is apt to become chronic.

Leucorrhœa may be divided into three kinds—*vulvar*, *vaginal*, and *uterine*. The first is most common in children, the second in young women, the third in elderly women. The vulvitis of children is generally due to dirt, thread-worms, debility, or gonorrhœa. In young women, anæmia and constipation are the commonest causes of discharge. After marriage, it is usually due to the results of child-birth (*e.g.*, subinvolution, misplacement of uterus, or septic infection), or it may be gonorrhœal. After the meno-pause, it may be caused by inflammatory conditions of the uterus or vagina, or it may be the result of malignant disease.

The *discharge*, if clear, comes from the uterus; if thick and white, from the vagina; if purulent, green, or yellow, it is often gonorrhœal; if offensive and watery, it generally indicates cancer.

The *treatment*, which will vary with the cause, will usually include vaginal douching. Vulvitis in children can generally be cured by syringing with a saturated solution of borax three or four times daily. Care should be taken that children are not infected one from another, separation and strict cleanliness in attending to the patient being essential.

V. Diseases of Vulva and Vagina.

Pruritus, or severe itching, may be a neurosis, or it may be due to a local condition (*e.g.*, the irritation of leucorrhœa, threadworms, scabies, or eczema; the congestion resulting from menstruation or pregnancy or the menopause; the presence of leucoplakia, or of cancer of the vulva), or it may be a symptom of diabetes. The urine should always be tested for sugar in these cases. The treatment is that of the cause.

Cancer of the Vulva, of which itching may be an early symptom, commences as a nodule on a labium majus; the ulceration which follows spreads to the neighbouring parts. It is often preceded by *leucoplakia* of the vulva, in which condition there is marked itching and the inner surfaces of the labia are smooth and appear as if covered by a layer of milk. A doctor should be at once consulted when leucoplakia is observed lest cancer ensue.

Bartholin's Gland, which is a small gland situated in the posterior part of the labium majus, may form a *cyst* or an *abscess*, often gonorrhœal in origin. Rupture of a vessel from a kick, or from pressure of the fœtal head during delivery, may cause a **hæmatoma** or blood tumour. **Varicose veins** may develop here in pregnancy, and if they burst the woman may bleed to death.

Vaginitis, or inflammation of the vagina, may be due to gonorrhœa, to sepsis after labour or operation, to a neglected pessary, or to old age. Treatment is by rest and douching.

Atresia means lack of patency of some part of the genital tract, usually congenital. It may occur in the lower part of the Fallopian tubes, in the uterus, rarely

in the cervix, and more frequently in the vagina. It occurs occasionally at the hymen, but is then sometimes due to vulvitis in childhood. Obstruction in the vagina causes retention of menses (*hæmatokolpos*) at puberty, necessitating operative interference.

VI. Diseases of the Uterus.

1. **Ulceration of the Cervix** may be due to laceration in child-bearing, to erosion, to gonorrhœa or syphilis, or to malignant disease. Erosion is more common in multiparæ, and may occur without laceration of the cervix; to the finger it feels like velvet. Malignant ulcers have a hard raised edge. Septic and syphilitic ulcers have well-defined margins and a sloughy surface. Symptoms of erosion may be absent, or the patient may complain of leucorrhœa; the other forms of ulceration give rise to pain in the back, and a discharge which is sometimes offensive. *Treatment.*—Laceration is repaired by operation, erosion by scraping, gonorrhœa by local applications or electrical means, syphilis by specific treatment, and malignant disease by removal of uterus, or, in late cases, by radium.

2. **Backward Displacement.**—In *Retroversion,* the uterus is tilted backwards without being bent. In *Retroflexion,* its body is bent backwards, but its neck remains in its normal position, so that the organ is concave behind. Usually both conditions are combined; the body is bent backwards and the neck is tilted forwards. The cause is generally stretching of the pelvic ligaments due to labour. The symptoms are those of congestion of the uterus (viz., backache, menorrhagia, and leucorrhœa), with those of

pressure on the neighbouring parts (*e.g.*, constipation and frequency of micturition). It often gives rise to sterility.

It is treated by operation (viz., by shortening the round ligaments, or by stitching the uterus to the abdominal wall), or by the use of a Hodge or a ring pessary. A *pessary* should not be worn more than three months without being removed and cleansed, and the vagina should be syringed with warm water night and morning while it is in use. Otherwise vaginitis or ulceration may be caused.

3. **Prolapse** is the term applied when the uterus is lower than it should be, the cervix extending to, or through, the vulval orifice. When the whole organ is outside, the term *procidentia* is used. It is commonly caused by a stretching of the ligaments and laceration of the pelvic floor in parturition, or it may be due to the frequent bearing-down strain of chronic constipation or laborious work. It is more apt to occur if the patient becomes emaciated. It gives rise to backache, leucorrhœa, constipation, and frequency of micturition. The anterior vaginal wall, with part of the bladder, may present at the orifice, forming a *cystocele*; or the posterior vaginal wall, with part of the rectum, forming a *rectocele*. It may be treated by the use of a ring pessary, after a preliminary repair of the perineum, or by stitching the uterus to the abdominal wall.

4. **Subinvolution.**—During the six weeks following labour, the weight of the uterus should fall from two pounds to two ounces. When, as often occurs, it does not return to the size it had before pregnancy, it is said to be in a condition of subinvolution. This is usually due to retention of a piece of placenta, membrane, or clot in the uterus during the early days of the puerperium, or to puerperal fever. It is more likely to occur if the baby is not suckled. The symptoms are backache, menorrhagia, and leucorrhœa; and the treatment rest, douches, and ergot, followed if necessary by curetting.

5. **Endometritis** is inflammation of the lining membrane of the uterus through septic infection, either puerperal or

gonorrhœal. The symptoms in the acute stage are pyrexia and purulent discharge; in the chronic stage, backache, menorrhagia, and leucorrhœa. When chronic, it is treated by curetting.

6. **Polypus.**—This may be (*a*) *placental*, as when a piece of placenta, left in the uterus at childbirth, does not decompose, but forms a polypus; (*b*) *mucous*, when the mucous membrane thickens over a small area until it may eventually reach the size of a small nut; (*c*) *fibroid*, when a small fibroid tumour under the mucous membrane has extended into the uterine cavity and acquired a stalk. Polypi produce menorrhagia, metrorrhagia, dysmenorrhœa, and leucorrhœa, and are treated by removal.

7. **Fibroid Tumour.**—One in every three women over fifty years of age has small fibroid tumours in the uterus. In only a small proportion, however, do they become large enough to produce symptoms, which generally begin between the ages of thirty and forty-five. They may be situated under the peritoneum (*sub-peritoneal*); in the wall of the uterus (*interstitial*); or under the mucous membrane (*sub-mucous*). The first and last may have a stalk (pedunculated). The main trouble is the bleeding (menorrhagia and metrorrhagia), which occurs in some cases of the interstitial and sub-mucous varieties to the extent of flooding. Leucorrhœa and dysmenorrhœa also occur, and miscarriage and sterility are frequent; while large tumours will press on neighbouring organs—*e.g.*, the bladder (frequency of micturition), the urethra (retention of urine), the ureters (kidney disease and uræmia), the rectum (constipation), and the blood-vessels (hæmorrhoids and varicose veins).

Fibroid tumours are *liable to various changes:* the solid tumour may become a cyst; it may become septic from disease of an adjoining part (appendix or Fallopian tube), or from pressure during labour, or from puerperal fever; rarely, it may become malignant, or may undergo "red degeneration." Fibroids grow more rapidly in pregnancy, and may form an obstruction to labour; nevertheless, in most cases no trouble arises.

If the fibroid is steadily increasing in size, if it is causing danger by pressure, or if it causes a woman to live the life of a chronic invalid from the repeated losses, it is becoming usual to advise removal of the uterus (*hysterectomy*). Otherwise, rest and the administration of ergot form the usual treatment of the hæmorrhage.

8. **Cancer.**—Cancer of the *cervix* occurs generally in women who have had several children, and who are between the ages of thirty-five and fifty. Cancer of the *body* of the uterus is much less common, and usually occurs after the menopause. The symptoms are hæmorrhage, leucorrhœa, which only becomes offensive later, and pain, which may not appear till late. The disease spreads, attacking the surrounding structures—the vagina and urethra (painful micturition and, later, retention of urine), the bladder (vesico-vaginal fistula), the rectum (recto-vesical fistula), the broad ligaments, and the ureters (uræmia). The patients die most frequently of exhaustion or uræmia.

The *treatment*, if the case is seen sufficiently early, is removal of the uterus and upper part of the vagina, with the near lymphatic glands and cellular tissue. If the case is too far advanced, palliative treatment only can be adopted—for the bleeding (ergot, hot douches, vaginal plugging), the leucorrhœa (douching, protecting the vulva from irritating discharges with ointment), and the pain (aspirin and, in late stages, morphine). Cleanliness, douching, frequent changing of dressings, clothing, and bed-linen, and fresh air in abundance, will be needed to reduce the offensive odour in advanced cases.

VII. Diseases of the Fallopian Tube.

1. **Salpingitis.**—Inflammation of the Fallopian tube, or salpingitis, is often due to gonorrhœa, or to sepsis after labour or miscarriage. It is a common cause of sterility. If pus collects in the tube, the condition is known

as *pyosalpinx*. Often the tube becomes fixed by adhesions to the intestine, uterus, and ovary, and this may render its removal by operation difficult.

In the *acute* form, there is pyrexia, with tenderness and severe pain in the abdomen, due to spread of infection through the opening into the peritoneal cavity. In the *chronic* form, which is much more common, the opening from the tube into the peritoneal cavity is closed by inflammation, and the patient has the symptoms of congestion of the genital organs (viz., backache, menorrhagia, dysmenorrhœa, leucorrhœa), and of adhesion to the neighbouring parts (viz., painful defecation or frequent micturition). At intervals, there may be attacks of local *peritonitis*, and if rest and douching do not relieve the condition, it is necessary to remove the tubes.

2. **Extra-Uterine Gestation.**—If the fertilised ovum is arrested in the Fallopian tube on its way to the uterus, the very serious condition of tubal gestation occurs. One of three things may happen :—

(1) In some cases the ovum soon dies and is absorbed.

(2) Most commonly it continues to grow, and *tubal rupture* happens. Before the twelfth week of pregnancy, usually between the sixth and tenth week, the ovum bursts the tube, causing sudden severe abdominal pain, with symptoms of internal hæmorrhage (viz., faintness, with a feeble and rapid pulse ; pallor and coldness of the skin, with a subnormal temperature ; thirst).

(3) Sometimes what is called *tubal erosion* occurs. The ovum bores its way gradually through the walls of the tube, and becomes adherent to the bowel, the adhesions forming a sac for the fœtus. The fœtus may then (*a*) die, and become infected with microbes from the intestine, the pus which forms discharging with the bones into the bowel, or through the abdominal wall ; (*b*) die, and become converted into a lime-impregnated mummy (*lithopædion*), which may remain for many years without harming the woman ; (*c*) grow, and rupture the sac enveloping it,

giving rise to violent internal hæmorrhage and acute abdominal pain.

The diagnosis is based on the symptoms of pain and internal bleeding, occurring in a woman who has missed one or two periods, and perhaps has had morning nausea and tenderness of the breasts. If diagnosed before rupture, the condition is treated by removal of the tube. After rupture, if there is danger of death from internal hæmorrhage, immediate operation is, of course, necessary. If, on the other hand, the shock is obviously passing off, and the pelvic hæmatocele is not extending, the practice of all surgeons is not the same; some operate, others treat by rest.

VIII. Diseases of the Ovary

Cystic Ovarian Tumours may be simple, glandular, papillomatous, or dermoid.

1. The *Simple Cyst* contains straw-coloured fluid, and does not grow to a large size. If it bursts, the fluid is absorbed, and the cyst may thus be cured.

2. *Glandular Cysts* are in part composed of glands, which secrete a mucoid fluid. Should the cyst rupture into the abdomen, the fluid continues to be secreted, and gradually produces distension of the abdomen.

3. *Papillomatous Cysts* contain little warty structures (papillomata), and, if the cyst ruptures, some of the warts it contains escape and grow on the peritoneum, causing fluid to accumulate. When the tumour is removed, however, the peritoneal warts disappear, unless the tumour happens to be a malignant one, as it sometimes is.

4. *Dermoid Ovarian Tumours* contain teeth, hair, bones, skin, and sometimes breast-tissue. If the fluid contents escape into the abdomen, peritonitis may result.

Apart from enlargement of the abdomen, the *symptoms* are principally those of pressure on the bladder and rectum; if the disease is advanced, amenorrhœa and emaciation may occur. An ovarian tumour increases the risk of child-

birth, both in pregnancy (by becoming inflamed), in labour (by causing obstruction), and in the puerperium (by twisting of the pedicle). Apart from childbirth, it may endanger life by pressure on the ureters (uræmia), by obstruction of the bowels, by twisting of the pedicle or stalk of the cyst, by internal hæmorrhage, or by suppuration.

Twisting of the pedicle is due to a rotation of the cyst, and gives rise to sudden pain with vomiting; the cyst rapidly becomes very congested, blood is extravasated, and it may burst. *Inflammation* is due to the cyst becoming infected from the intestines, or from a diseased appendix or Fallopian tube. It often results from twisting of the pedicle, and may stop short of suppuration. Should suppuration occur, the pus may be evacuated through the abdominal wall, or may burst into the bowel, bladder, or vagina. Owing to these very serious risks, ovarian tumours should be removed at the earliest possible moment.

IX. Pelvic Cellulitis and Peritonitis.

Parametritis, or *pelvic cellulitis,* is an inflammation of the cellular tissue of the pelvis, due to infection of a wound caused by labour or by operation. The symptoms are pyrexia and abdominal pain, with tenderness which is usually limited to one side. In about half the cases an abscess forms which points above the groin, where it will be opened by the surgeon. Vaginal douching and abdominal fomentations are indicated pending the opening of the abscess.

Perimetritis, or *pelvic peritonitis,* is inflammation of the peritoneum lining the pelvic cavity and covering the organs its contains. It is generally due to an extension of a septic infection of the genital canal, following labour, or miscarriage, or gonorrhœa. Appendicitis may also infect the pelvic peritoneum. There is great pain in the lower abdomen, which is rigid and tender; the temperature is

raised, and the patient complains of pain on micturition. The inflammation may subside without ill result, or, on the other hand, an abscess may form which, unless operated on, may burst into the bowel, bladder, or vagina. Sometimes the illness is fatal. When the cause is recognised early as salpingitis or appendicitis, operation is often performed; otherwise the local treatment is vaginal douching and abdominal fomentation

This is an opportune moment to point out that a woman's genital canal forms an open tube leading from outside her body to her peritoneal cavity, and that inflammation of any one part is liable to spread to other parts of it. Thus, from infection introduced from without, there may result in sequence vulvitis, vaginitis, endometritis, salpingitis, ovaritis, pelvic peritonitis, and general peritonitis.

X. Disorders of the Urinary System.

1. **Urethral Caruncle.**—This is a small red growth, composed largely of blood-vessels, at the orifice of the urethra, often very tender, occurring most commonly in middle-aged married women. The treatment consists in removal by excision and cauterisation.

2. **Cystitis,** or inflammation of the bladder, may result from the use of a catheter which is not sterile, or it may be secondary to septic disease of the kidney or urethra, or it may be due to injury or a stone, or it may be caused by retention of urine. It may be *acute*, in which case there is pain in the perineum and above the pubes, with frequent and painful micturition, and alkaline urine containing blood and pus; or, more commonly, *chronic*, in which there is generally but little pain, but frequent desire to pass water, with urine either alkaline and offensive, with pus and mucus, or—if due to infection with the bacillus coli—acid, with a little pus. Cystitis may lead to inflammation of the pelvis of the kidney (*pyelitis*), or of the kidney (*septic nephritis*). The treatment, if the urine is alkaline and

ammoniacal, consists in washing ou the bladder. If the urine is acid, urotropin and acid sodium phosphate given internally are often effective.

3. **Frequency of Micturition** may be caused, as already said, by cystitis, cystocele, and pressure on the bladder by the pregnant uterus or by an ovarian or fibroid tumour. On the other hand, it may be due to an abnormal quantity of urine being secreted, as in diabetes, Bright's disease, and hysteria. Sometimes it results from overflow in retention.

4. **Incontinence** is the involuntary escape of urine. Sometimes this occurs on the slightest exertion, especially after childbirth, from stretching of the sphincter. Sometimes it is continuous, as when there is a fistula between the bladder and the vagina (*vesico-vaginal fistula*), due either to cancer, tubercle or syphilis, or to pressure of the fœtal head during labour, or to a forgotten pessary. Sometimes a slight dribbling is due to the bladder being over-distended: this should be carefully distinguished from incontinence. Nocturnal incontinence is common in children. Incontinence due to a fistula is treated by a plastic operation; that resulting from a stretched urethra by electricity.

Retention may be due to hysteria, to a painful condition of the urethra, to pressure on the urethra by a tumour, to the shock of an operation on the abdomen, vagina, rectum, or perineum, or to various paralytic conditions. Treatment varies according to the cause: sometimes a purge is sufficient, or a hot bath; sometimes a catheter is necessary.

Suppression of urine occurs when the kidneys cease to act. It may be due to kidney disease, or to the ureters being injured in an operation; partial suppression may be due to the shock of a severe operation. The patient becomes drowsy and vomits; later coma and convulsions occur. The treatment is that of uræmia.

XI. Examination of Patients.

It is usual to follow a routine in examining gynæcological patients. First, the breasts and abdomen are examined, then the vulva, then the vagina, uterus, Fallopian tubes, and ovaries (*bimanual examination*). For the first, the recumbent position is required; for the second, the left lateral; for the third, the left lateral, or the semi-prone, or the dorsal.

An examination is always an ordeal to the patient, and the nurse, by her manner and tact, can do much to help her. A screen should be placed round the bed, and by means of sheets it should be arranged that there is no undue exposure. The bladder and rectum should be empty, and the external genitals clean. Everything should be at hand, so that the nurse will not have to leave the patient during the examination. Rubber gloves, vaseline, and a receiver with swabs should be provided, and the condition may require also a speculum, sound, vulsellum forceps, probe, cotton-wool, sponge-holder, sponges, tampons, and scissors, with an artificial light and head-mirror. The chest should be covered with a warm cot blanket or shawl. Some women like a towel over the face. If the patient is not in bed, her skirt and corsets should be removed and her underclothing loosened, so that the abdomen, &c., may be freely examined.

1. *Recumbent Position* (for abdominal examination).—Pillow under head and shoulders to relax the abdominal muscles; blankets turned right down; sheet drawn down to pubes; chemise or nightgown drawn up to breasts.

2. *Left Lateral Position.*—Patient on left side, with head on pillow, and knees well drawn up; buttocks right on the edge of the bed; sheet arranged so that vulva can be readily inspected.

3. *Semi-prone* (*Sims'*) *Position.*—Patient on left side, with face and breasts on pillow; left arm hanging over the edge of bed behind her; buttocks right at edge of

bed ; right thigh more flexed than left. When the labia are separated, the air enters the vagina and distends it, allowing a good view of the cervix when the posterior wall is retracted with a speculum.

4. *Genu-pectoral or Knee-chest Position.*—Patient kneeling so that thighs are vertical and slightly separated ; feet projecting over edge of couch ; breasts on pillow, and face turned to one side ; lower limbs warmly clad, and patient covered by a sheet. It is only occasionally used, as in replacing a tumour or gravid uterus impacted in the pelvis.

5. *Dorsal Position.*—Patient recumbent, with knees drawn up and separated ; sheet over knees. If the patient is on a table, the buttocks are drawn to the edge, with the feet resting on chairs so that the thighs are slightly flexed ; the dressing-gown is folded over each thigh, and a sheet is arranged from the waist downwards, being gathered up between the thighs if the vulva is to be examined.

The left lateral and semi-prone positions are useful when inserting pessaries, or applying minor treatment to the vagina or cervix ; the dorsal position is excellent for passing the catheter.

XII. Nursing Procedures.

1. **Vaginal Douching.**—See p. 139.

2. **Tampons** are used for the purpose of making applications in the inflammatory conditions of the genital tract.



Aveling's Vaginal Tampon Introducer, consisting of glass speculum and wooden introducing rod.

A piece of wool, about the size of a hen's egg, is wrapped in a single layer of gauze, round which is tied a piece of fine string, silk, or tape. After dipping it in the medicament which has been ordered by the surgeon, the tampon is introduced by means of long uterine forceps through a Sims' speculum, which is held in the left hand, and is gradually withdrawn as the plug passes in, the patient lying on her left side in the position previously described. The end of the silk or tape is left outside the vagina, so that the tampon can be easily withdrawn. It should be kept in position about twelve hours, and the patient should wear a diaper, as this form of application usually causes a copious discharge. The bladder should be emptied and the vagina douched before the tampon is inserted.

3. **Plugging the Vagina.**—This is usually done to stop hæmorrhage from the uterus in cases of abortion, and, more rarely, when it is affected with cancer. This operation will be carried out by the medical attendant, though in his absence the nurse would certainly be justified in attempting to arrest severe bleeding by this method of treatment. Before commencing it, she should make sure that the bladder is empty.

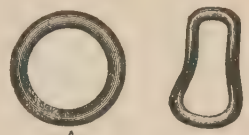
Sterilised rolled gauze, or, if this is unobtainable, strips of linen or lint about 12 inches long and 2 inches broad, are taken, and a piece of tape tied firmly round the end of each. They are then systematically and evenly packed into the vagina through a Sims' speculum by means of uterine dressing-forceps, until the whole canal is completely filled.

4. **Catheterisation.**—See p. 156.

5. **Introduction of a Pessary.**—The patient should lie upon her side or on her back with the thighs flexed. The instrument should be sterilised by scrubbing in warm soapy water, followed by an antiseptic lotion (*e.g.*, lysol).

A *Hodge pessary* is held in the fingers of the right hand, and introduced in the antero-posterior diameter of the vulva, the perineum being held back by the left index finger; it is pushed upwards and back-

wards until one-half is within the vagina. The right index finger is then passed along the posterior vaginal wall to the upper bar of the pessary, and this is pushed into position behind the cervix; rotation into the transverse diameter occurs as this is being done. The lower end should now lie just within the vagina, and in contact with its anterior wall. A daily vaginal douche is advisable, and the pessary must be changed after not more than three months.



Pessaries.

A. Watch-spring, covered with India-rubber.
B. Hodge's Double Curve.

A *ring pessary* is held in the right hand, the index finger being passed through the ring, which is compressed to an oval between the thumb and middle finger. It is introduced as in the case of the Hodge pessary until one-half is inside, and then allowed to expand. On being gently pushed upwards, it will rotate of itself into the transverse diameter; the index finger should guide the upper part along the posterior vaginal wall until it lies behind the cervix. The lower part will now lie behind the lower part of the symphysis pubis.

XIII. Gynæcological Operations.

The following are the more important operations commonly performed :—

1. **Abdominal.**—(1) *Myomectomy.*—Removal of fibroid tumours without sacrificing the uterus.

(2) *Sub-total Hysterectomy.*—Removal of the uterus, with or without the appendages, by amputation through the cervix.

(3) *Total Abdominal Hysterectomy,* or *Panhysterectomy.*—Removal of the entire uterus, with or without the appendages, by dividing the vagina close to the attachment to the cervix.

(4) *Wertheim's Operation.*—Removal of the uterus and appendages with the infected cellular tissue and glands, and also enough of the vagina to form a capsule for the enclosure of the malignant cervix.

(5) *Ovariotomy.*—Removal of an ovarian tumour.

(6) *Oöphorectomy.*—Removal of an inflamed ovary.

(7) *Salpingectomy.*—Removal of a tube, for hydrosalpinx, &c.

(8) *Salpingo-oöphorectomy.*—Removal of tube and ovary, for pyosalpinx or extra-uterine gestation.

(9) *Ventrifixation,* or *Hysteropexy.*—Stitching the body of the uterus directly to the abdominal wall, for displacement or prolapse.

(10) *Ventrisuspension.*—Shortening the round ligaments, for backward displacement of the uterus.

2. **Vaginal and Vulval.**—(1) *Colpotomy.*—Opening the utero-vesical pouch or the pouch of Douglas, to evacuate blood or inflammatory fluid.

(2) *Vaginal Hysterectomy.*—Removal of the uterus through the vagina.

(3) *Dilatation of the Cervix.*—For spasmodic dysmenorrhœa or purulent endometritis, or as preliminary to curetting.

(4) *Curetting.*—For endometritis, sterility, or repeated abortions.

(5) *Amputation of Cervix.*—For hypertrophy.

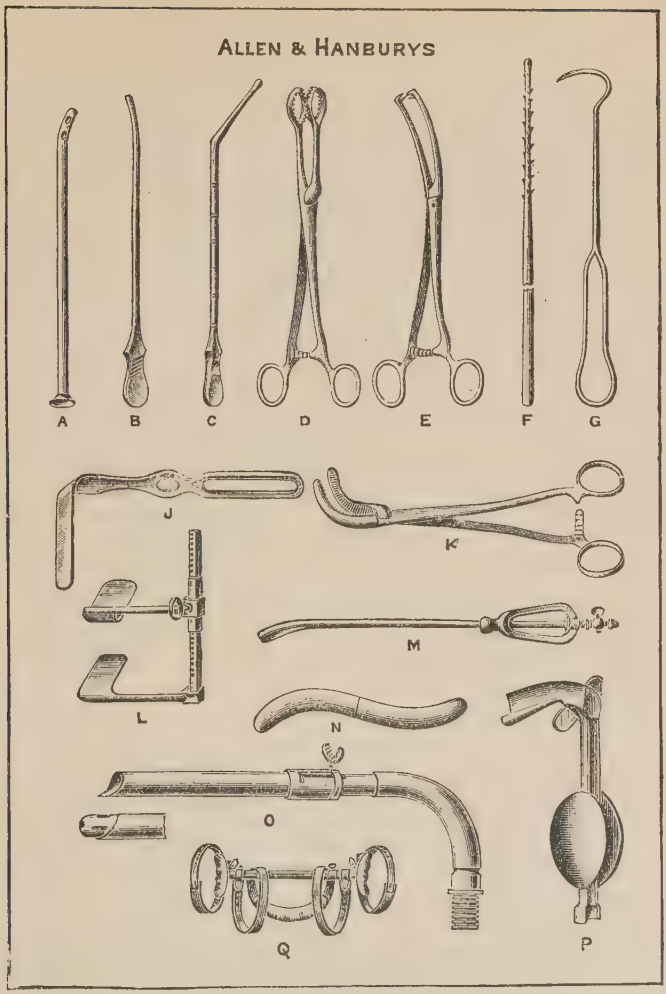
(6) *Trachelorrhaphy.*—For repair of a cervix torn in labour.

(7) *Perineorrhaphy.*—For repair of a perineum torn in labour, either partially or into the rectum.

(8) *Other Plastic Operations.*—For cystocele, rectocele, or fistulæ between vagina and bladder, or vagina and rectum.

Instruments.—The number of each should be known before the operation is commenced and checked at the end of it, lest one should be left in the abdomen. For the same reason all sponges should be counted, while those to be used in the abdomen shall have a tape sewn to them.

For all gynæcological operations, the following instru-



Gynæcological Instruments.

A. Catheter. B. Bladder Sound. C. Uterine Sound. D. Ring Forceps. E. Vulsellum. F. Playfair Probe. G. Pedicle Needle. J. Vaginal Retractor. K. Vaginal Clamp. L. Self-retaining Retractor. M. Flushing Curette. N. Metal Dilator. O. Ovariotomy Trocar. P. Auvard's Speculum. Q. Clover's Crutch.

ments should be put out—catheter, scalpels, long dissecting forceps, blunt-pointed scissors, long and short artery forceps, ring forceps, vulsellum forceps, half-circle needles of various sizes, needle-holder, silk, cat-gut, and silkworm gut.

(*a*) *For operations by the abdominal route* retractors are needed; one that is self-retaining (*e.g.*, Bonney's, Gosset's, or Faure's) is an advantage. In *ovariotomy* an ovariotomy trocar, with a rubber tube to lead away the escaping fluid, is used if the cyst is large. A *Wertheim's operation* requires a broad bladder retractor, two vaginal clamps, angular pressure forceps, pedicle needle, aneurism needle, and long angular scissors.

(*b*) *For vaginal and vulval operations* there should be provided a Clover's crutch, a bladder sound, a speculum (*e.g.*, Auvard's self-retaining weighted speculum), and metal dilators. In addition, in *vaginal hysterectomy*, a pedicle needle and vaginal retractor; and for *curettage*, a uterine sound, Playfair's probes, and a flushing uterine curette. In *perineorrhaphy*, the same instruments should be ready in case curettage is necessary. For *fistulæ* between the vagina and bladder or rectum, cleft-palate instruments and needles are sometimes used.

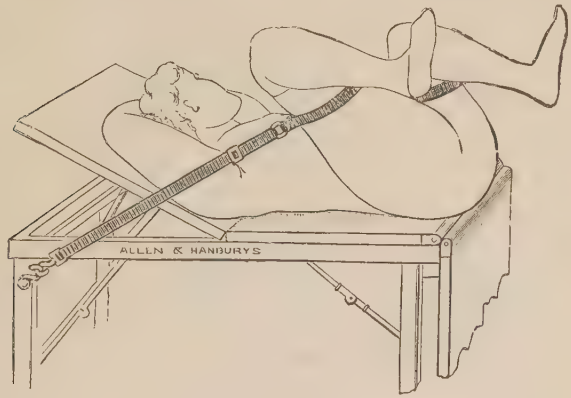
A Playfair's probe or a uterine sound may be used in making applications to the uterus. To dress it for the purpose, wet the end of the instrument and place it on a thin film of cotton-wool, about $2\frac{1}{2}$ inches square, lying on the palm of the left hand. Now close the hand, and turn the instrument round, so that the wool is firmly and evenly rolled on, and projects $\frac{1}{4}$ inch beyond the end. It can be readily removed by unrolling under water. To enable the application to be made, a speculum is required; those most commonly used being the Ferguson cylindrical speculum and the Sims' duckbill speculum. Before use it should be held for a moment in warm water, and oiled on the outer surface.

Position.—For abdominal operations on the pelvic organs the *Trendelenberg position* is used; the body is

tilted until the pelvis is considerably higher than the chest, causing the intestines to sink away towards the diaphragm, and leaving the pelvis empty of movable viscera.

For vaginal and vulval operations, the *lithotomy position* is adopted; the buttocks are drawn a little over the edge of the table, and the limbs are well flexed, being kept in this position by means of a Clover's crutch, strapped to the legs below the knees.

Preparation and After-Treatment follow the lines laid down in the chapter dealing with general operations.



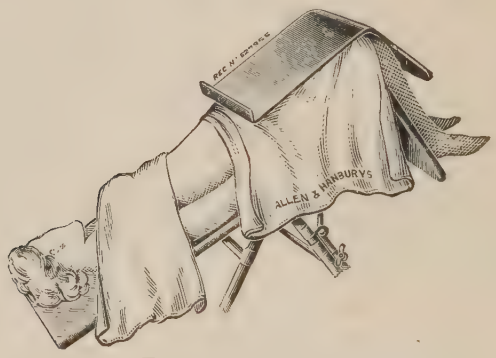
Lithotomy position.

Before commencing any operation of this nature, it is usual to pass a catheter to ensure that the bladder is empty.

Before *perineorrhaphy*, it is necessary to empty the bowels thoroughly; an aperient is given two nights in advance, followed by an enema on the night before, and again on the morning of, the operation. An enema is administered about thirty hours after the operation, and an aperient two days later. It is well to give only liquid diet until the bowels have acted. Some surgeons have a catheter passed until the bowels have acted, others prefer that the patient should kneel in bed to pass urine. The patient is

most comfortable lying on the side. The dressing of gauze, wool, and T-bandage must be changed twice daily, and whenever soiled. Stitches are taken out on the twelfth day, unless catgut has been used.

After *curettage of the uterus*, any tampons or gauze which may have been inserted are generally removed on the following morning, and the pad and T-bandage changed. Some surgeons douche twice a day, before and after operation. After *hysterectomy*, the gauze inserted in the vaginal operation is removed at the end of thirty-six hours, and the lower part of the vagina cleansed. Clamp forceps, if



Trendelenberg position.

any have been left on, must not be disturbed. Douching twice daily may be required, if the discharge is very offensive after ten days. Douching is not usually required after abdominal hysterectomy.

Complications.—*Thirst, pain, vomiting, sleeplessness, distension, shock, hæmorrhage,* and *sepsis,* all of which may follow a gynæcological operation, are dealt with in the chapter on the after-treatment of general operations. *Peritonitis, intestinal obstruction, femoral thrombosis,* and *pulmonary embolism* are other very important complications.

In *general peritonitis* the onset is gradual, and the signs do not become marked until the third day. The pulse

does not fall as usual ; the temperature rises ; the tongue becomes dry ; vomiting occurs without nausea ; the abdomen becomes distended, tender, and rigid ; breathing is thoracic ; and hiccough is common.

Intestinal obstruction is commonly due to an adhesion—*e.g.*, to the pedicle. There is colicy pain, increased by manipulation ; the abdomen is distended and rigid ; the passage of flatus ceases ; vomiting occurs and may be fæcal ; the pulse is rapid, but the temperature is often low.

In *femoral thrombosis*, about the end of the second week the leg (usually the left) becomes swollen, tense, and painful, and the temperature often rises. After a few days it begins gradually to get better, although sometimes the swelling is permanent. Treatment is by rest on a pillow, with complete absence of movement ; glycerine of belladonna and fomentations may be used to relieve pain. The danger is that the clot may be disturbed, and, escaping into the circulation, cause pulmonary embolism.

In *pulmonary embolism*, if the pulmonary artery is entirely blocked, sudden death occurs. If it is only partially blocked, the patient will sit up struggling for breath, and her face will become blue or grey. The nurse may administer brandy or oxygen, and may give morphine to relieve the distress.

CHAPTER XXXVI.

MIDWIFERY.

The following brief account of normal labour is given as an introduction to an account of puerperal fever and some of the disorders of pregnancy :—

I. The Course of Parturition.

For a week or two before delivery, the uterus sinks deeper in the pelvis, giving rise to more frequent micturition and emptying of the rectum. The vaginal secretion becomes more abundant, and slight pains lasting a few hours may occur each evening for several days.

Labour is divided into three stages: *first*, the dilatation of the cervical canal and os; *second*, the period from the full dilatation of the os to the expulsion of the child; *third*, the delivery of the placenta. The average duration of labour is about fifteen hours in primiparæ, and seven or eight hours in multiparæ. The pulse and temperature usually rise but slightly; if labour is prolonged, the rise is greater.

1. **The First Stage.**—The preliminary pains now become more marked, and a separation of the membranes from the uterine wall near the internal os is indicated by a "show," a discharge of mucus tinged with blood. The cervix becomes expanded so as to form one cavity with the body, and the bag of membranes rests on the external os and stretches it. The os yields gradually to successive pains, and its edge becomes softer and thicker. As the dilatation increases, the pains, which now last about a minute, recur at progressively shorter intervals. The bag of membranes protrudes more and more, and eventually

rupture takes place; some of the liquor amnii escapes, and soon the whole cervix forms a continuous tube with the vagina. Sometimes, however, the membranes are tough, and the head may even pass through the vulva with them intact; in these cases the child is said to have been born with a "caul." If, on the other hand, the membranes rupture before the os is fully dilated, an effusion of serum takes place beneath the scalp or other presenting part of the child, forming a prominence, called the *caput succedaneum*, which may be raised half an inch or more from the surface of the cranium.

2. **The Second Stage.**—When the os is fully dilated and the membranes have ruptured, the pains become much more powerful and prolonged. As the head begins to press upon, and pass through, the vulva, there is hardly any interval between them, and the patient more or less involuntarily aids them by bearing-down efforts, as in defecation. The head now distends the perineal body, the rectum is flattened by the head, the anus elongates to an inch or more, and eventually the stretched edge of the perineum slips quickly over the head, some laceration at the posterior part of the vaginal outlet being inevitable in a primipara. The body soon follows, with a gush of liquor amnii and generally some blood, which indicates the partial detachment of the placenta. The pressure on the head during its passage produces temporary changes in it—viz., a general diminution in its size, and an alteration in its shape, for the cranium gets moulded to facilitate its transit through the pelvis.

3. **The Third Stage.**—The uterus after the birth of the child is one inch below the umbilicus; it feels moderately hard with slight rhythmical contractions. The shrinkage of the placental site, and the pouring out of blood between the separated surfaces, now complete the detachment of the placenta. It is expelled from the body of the uterus so that it comes to lie partly in the relaxed cervix and partly in the vagina. The uterus then reaches to the umbilicus. After delivery of the placenta, the uterus may be felt as a firm ball, usually reaching to about five inches above the

pubes, and varying in hardness with its rhythmical contractions.

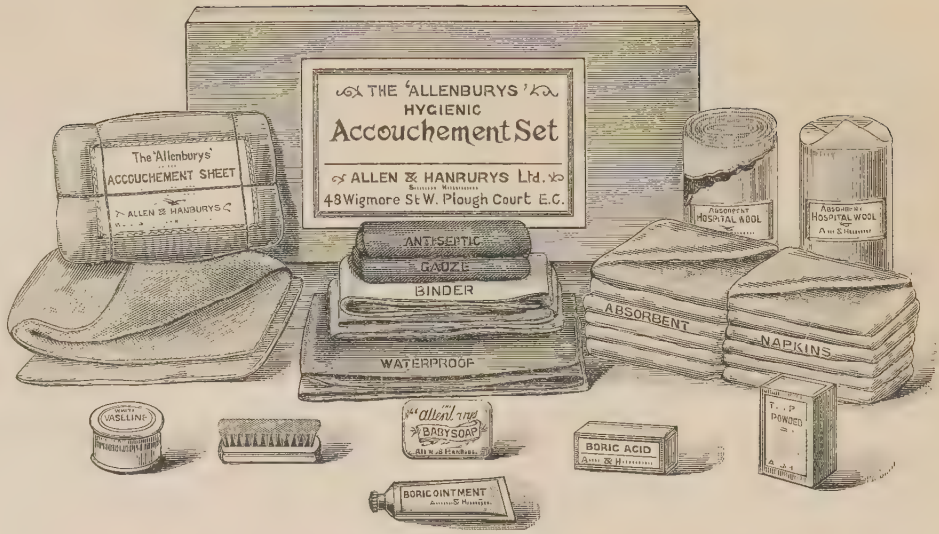
4. **After Delivery.**—The exertion of labour is generally soon followed by sleep. The pulse falls below normal. The temperature, which soon sinks to the normal level, readily rises from slight cause. A rise of more than two degrees should cause anxiety as to the presence of sepsis, but it may be due to constipation or irritation of the breasts, or follow laceration of perineum or cervix.

The uterus continues to contract rhythmically, and this may give rise to intermittent *after-pains*. It may be felt above the pubes for ten or fourteen days, and takes six to eight weeks to complete its involution. The *lochial discharge* from the uterus, cervix, and vagina lasts two or three weeks after delivery. At first it is almost pure blood; on the third day it becomes paler, and on the ninth day is usually yellow with a grey or greenish tinge.

The breasts during the first two days secrete a small quantity of *colostrum*, a clear mucoid fluid containing yellowish streaks; this has a laxative effect on the infant. About the third day the breasts become full and congested, and thin bluish milk appears.

II. The Management of Parturition.

It is important that the sanitary arrangements of the house should be in good order, and the room airy and quiet. The bed should be firm, a feather bed especially being avoided. The bedding should be protected by a macintosh, and a draw-sheet, folded in several thicknesses, placed under the hips. The patient should be in her night-dress, over which she may wear a dressing-gown in the earlier part of labour; a washable petticoat, fastened loosely round the waist, can be worn during delivery and slipped off when it is over. The rectum should be cleared out by an enema to avoid extrusion of fæces by the advancing head.



Accouchement Set.

Consisting of absorbent pads or towels, accouchement sheet (24×24 ins.), toilet powder, boric ointment, safety pins, linen thread, waterproof sheet (36×36 ins.), absorbent wool, and vaccination pad.

Every case must be conducted with the most scrupulous attention to surgical cleanliness. All instruments, catheters, douche-tubes, &c., must be boiled before use. The vulva always requires disinfection. The hands and forearms of doctor and nurse should be well scrubbed and immersed in biniodide solution. The nurse's clothing must be sterilised after an infectious case.

1. **The First Stage.**—The patient should walk about, sit in a chair, and lie on her back alternately, and should not attempt bearing-down efforts, which in this stage are useless. Occasionally the use of a catheter is called for by difficulty in micturition. If, when the os is fully dilated, the doctor considers it advisable to hasten matters by rupturing the membranes, a bedpan should be placed under the patient to prevent her getting wetted.

2. **The Second Stage.**—The patient should now lie down on her left side, with the hips near the edge of the bed. A round towel for her to pull on may be tied to the foot of the bed, where something firm may also be put for her to rest her feet against. When the head is beginning to press upon the perineum, it is often advisable to delay its too rapid advance lest laceration occur. This may be attempted by telling the patient to cry out and not hold her breath when the tension becomes dangerous, and by pressing the head forward toward the pubic arch and keeping it flexed. When the head begins to distend the orifice, the left hand is passed over the patient's abdomen and between her thighs. With the finger-tips of this hand pressure is kept on the child's forehead as it is emerging over the perineum, so keeping the head flexed; while at the same time the right hand, with thumb and fingers on each side just in front of the anus, pushes the head forward. The patient's right thigh is raised by an assistant. The left hand is then placed upon the abdomen to follow down the fundus as it diminishes in size, and make sure that it remains contracted. As soon as the head is born, the eyelids should be wiped clear of mucus. The funis should not be tied for about five minutes, when usually pulsations near its placental end will have stopped. Several strands

of thread knotted together, or a narrow tape, may be used, the ligature being placed about two inches from the umbilicus, and the funis cut about half an inch beyond the ligature.

3. **The Third Stage.**—As already said, during the birth of the body of the child the contracting uterus is followed down with the hand, and by pressure, and perhaps gentle friction, it is stimulated to maintain its retraction. After about a quarter of an hour, as a rule, strong pains return, and the placenta is detached and expelled into the lower part of the uterus or vagina. This is known by the uterus rising to the umbilicus, and becoming harder, smaller, rounder, and more movable. If after detachment the placenta is not expelled, its delivery may be assisted as follows: the fundus is grasped with the palm and fingers, and circular compression is made upon the body of the uterus, which at the same time is pressed gently downwards in the direction of its axis. In this way the placenta can generally be expressed into the bed. The patient should be lying on her back.

The placenta should be examined to see that it is complete along its margin, and that no part has been left behind in the uterus; similarly with the membranes, the outer rough chorion and the inner smooth amnion, the chorion being the more likely to be partially left behind. The perineum should also be inspected to see whether there is a rent requiring suture.

4. **After Delivery.**—A binder is often applied after an interval of half an hour or so, and liquid extract of ergot may be administered as a greater security against hæmorrhage. All soiled linen, &c., should be removed from the room. A little beef-tea or an egg beaten up in milk may now be given; visitors should be excluded, and the patient encouraged to sleep. The pulse and temperature should be recorded for the first week, and the amount of urine passed observed. The patient must lie down for the first twelve hours; afterwards she may kneel up to pass urine, or sit up or lie on her face for this purpose. She should vary her position in bed to encourage

drainage away of the lochia, and after a day or two may be propped up for meals or suckling. Milk, bread and butter or toast, eggs, and gruel, may be given during the first day or two, with fish or chicken on the third or fourth day, followed by ordinary diet. Cleanliness is of the greatest importance: the genital organs should be washed several times a day, and the vagina douched if the lochia become offensive. The bowels should be opened on the third day by enema or mild laxative.

The patient, if progress is satisfactory, may get up on the tenth day and lie on a couch; ordinary life, however, should only be gradually attained, and no arduous duty undertaken under six weeks. A primipara with much laceration will generally be in bed three weeks.

The infant, as is well known, does better if suckled, particularly during the first two months of life, when the dangers of hand-feeding are specially great. Suckling is also a natural stimulus to the involution of the uterus, and it is therefore very desirable that the patient should at least partially nurse the child during the six weeks following parturition.

III. The New-Born Infant.

The Fœtus at full term is 21 in. in length, and weighs 7 lb. on an average; the finger-nails project beyond the tops of the fingers, and the hair of its head is from 1 to 2 in. long. Within a few hours it passes urine and the dark-coloured contents of the large intestine, *meconium*, which consists of intestinal mucus mixed with epithelium and bile. In a day or two the motions become yellow and soft, and are passed at intervals of a few hours. The child loses weight for the first few days, regaining it by the end of the week. The umbilical cord dries and separates close to the edge of the skin, leaving a granulating sore, which heals in a few days. The caput succedaneum disappears

after a day or two, and within a fortnight the head returns to the original shape from which it was moulded during delivery. The skin is red for a week, and the breasts may become swollen for a few days. At the end of the first week the skin may become yellow for a few days without pigmentation of the urine.

Management.—Soon after delivery the child's face is cleansed, and it is placed in a warm bath and washed with soap and water to remove the vernix caseosa. The funis may be wrapped in a piece of scorched linen, or in absorbent gauze or wool; it is then turned upward on the abdomen and kept in position by a binder. The clothes should not be too tight; diapers should be changed as soon as they are wetted. The child should be washed in a warm bath, at first once, then twice a day, and dried with fine starch powder.

IV. Puerperal Fever.

Puerperal Infection may occur after abortion as well as after labour. It is due to the development of pathogenic bacteria, which enter the body through wounds of the genital tract, being introduced from without. Shortly before the middle of the last century the mortality in maternity hospitals from this cause sometimes reached the appalling figure of 60 per cent. At present in similar hospitals it is about 1 per 1000. Notwithstanding this improvement, the mortality from puerperal infection is still much too high in England; of 2971 women who died in childbirth in 1922, no fewer than 1079 died from puerperal fever, a preventible condition.

Causation.—The bacteria involved are often streptococci, sometimes staphylococci or other pyogenic organisms. They are introduced by surgically unclean fingers, instruments, diapers, or other things applied to or through the vulva. Local sores (fistula-in-ano, boils, &c.), sores on the hands of medical attendant or nurse, and insanitary sur-

roundings, increase the risk considerably. But of all modes of infection, the one most to be feared is the carriage of organisms from a case of puerperal infection.

The main *channels of infection* are the broken surface left by the separation of the placenta, and the lacerations which occur in the cervix or near the vulva.

Prevention.—A strict antiseptic routine should be followed in midwifery, unnecessary examinations should be avoided, and the third stage of labour should be carefully and properly managed.

Varieties.—Apart from general peritonitis, which is very rare, the following are recognised: (1) *uterine infection*, giving rise to sapræmia or septicæmia; (2) *pelvic infection*, giving rise to cellulitis and peritonitis; (3) *thrombosis*, giving rise to white leg. Occasionally pyæmia (see p. 471) may occur when septic clots in the pelvic veins give off multiple small infective emboli.

Symptoms.—The onset always occurs in the first week, and generally in the first four or five days.

In mild cases, *sapræmia* (p. 471) begins with headache, malaise, and moderate pyrexia (103° F.); in severe cases, there may be a rigor and vomiting. The uterus, which may contain infected blood-clot or pieces of placenta, is abnormally large and usually tender to the touch, and the lochia become offensive.

In *septicæmia* (p. 471) rigors are more frequent; the temperature is irregular and high (103° to 105° F.), and the pulse rapid; the lochial discharge ceases; vomiting, diarrhœa, and sleeplessness are common, and bacteria may be found in the blood. Intense anæmia occurs if the illness is prolonged.

Pelvic cellulitis (p. 649) does not usually produce severe symptoms until the fifth or sixth day; pelvic pain, which is absent in sapræmia and septicæmia, is a prominent feature.

Pelvic peritonitis (p. 649) is usually followed by spontaneous absorption.

White leg, or "phlegmasia alba dolens," is generally due to femoral thrombosis, the symptoms and treatment of which are described on p. 661. It usually occurs in the latter half of the second week.

Treatment.—Sapræmic cases, if mild, are usually cured by hot vaginal douching with a mild antiseptic (lysol, ½ dr. to 1 pint), ergot, and free purgation. The more severe cases require a very gentle curetting under an anæsthetic, followed by a uterine douche containing lysol, izal, cyllin, or tincture of iodine; a vaginal douche should be given twice daily for several days.

Septicæmia may be treated by subcutaneous saline injections, and the administration of a suitable antitoxic serum. Milk should be freely given, the bowels kept open, and sleeplessness controlled by hypnotics.

V. Some Disorders of Pregnancy.

1. **Reflex Disorders.**—The commonest are vomiting and other digestive disturbances, salivation, neuralgia, cough, pruritus, and hysteria. *Morning sickness* is most troublesome during the second, third, and fourth months; the vomiting, however, may not be limited to the morning, and it may last throughout pregnancy. It is well that the patient should take a little food before getting up; calomel, bismuth with bicarbonate of soda, oxalate of cerium, or potassium bromide may also be found useful. In extreme cases it may be necessary to induce abortion. In *neuralgia*, the teeth should be attended to, and quinine and iron may be given.

2. **Eclampsia,** or puerperal convulsions, is distinct from epilepsy, and is associated with a large quantity of albumen in the urine. It occurs usually during the last months of pregnancy, during labour, and after delivery, and the prognosis is grave. The convulsions show a general resemblance to those of epilepsy. The *treatment* is usually

that of uræmia (*e.g.*, venesection, pilocarpine, morphine) chloroform may be administered and labour accelerated.

3. **Hæmorrhage** in the earlier months indicates threatened premature expulsion of the ovum. In the later months it may similarly indicate partial separation of a normally situated placenta—often as a result of violence, and hence called *accidental hæmorrhage ;* or it may be what is called *unavoidable hæmorrhage—i.e.*, hæmorrhage due to the implantation of the placenta so low down in the uterus that it must become detached in the dilatation of the cervix (placenta prævia).

4. **Premature Expulsion of the Ovum** is usually termed an "abortion," or "miscarriage," if it occurs before the time when the child can possibly survive—*i.e.*, before the twenty-eighth week ; after that period it is called a "premature labour." It is within the first few months of pregnancy that such expulsion is most common.

Causation.—It is most liable to happen at the time which would have been a menstrual period if pregnancy had not occurred, and some women are more prone to it than others. It may be due to local conditions, such as the death of the fœtus, especially from syphilis, separation of the placenta by blows or straining, or displacement or inflammation of the uterus ; or it may result from acute febrile diseases or various poisons, or from violent emotions affecting the mother. To prevent abortion in those subject to it the greatest care is necessary during the first few weeks : mental excitement, undue exertion, strong purgatives, and vaginal douches must be avoided, and if syphilis is present it must be treated.

The early *symptom* is hæmorrhage accompanied by pain. If the abortion is incomplete and part of the placenta remains behind, intermittent hæmorrhage continues and decomposition follows, with possibly septicæmia.

Treatment.—When abortion threatens, the patient should lie recumbent in bed ; morphine may be given and purgatives should be avoided, an enema being used if necessary.

If abortion is inevitable, as when hæmorrhage is excessive or the liquor amnii escapes, nature will usually do all that is required ; but sometimes it is necessary for the surgeon to empty the uterus, either by plugging the vagina or using uterine dilators. If the abortion is incomplete, it will be necessary to curette the uterus. The patient must never make light of a miscarriage and get about too soon, as this is a common cause of chronic uterine disease.

APPENDIX I.

SUBJECTS OF EXAMINATION.

To assist the probationer in locating the subjects which appertain to the branch of nursing for which she is training, the items specified in the several revised syllabuses, charts, and schedules are indicated below chapter by chapter.

I. *Re* Preliminary Examination (England and Wales).

(*General Nursing, Sick Children's Nursing, and Fever Nursing.*)

Chap. 1 (p. 1).—Ethical aspects ; hospital etiquette.

Chap. 2 (p. 9).—*Air :* its composition and impurities ; the principles of ventilation, natural and artificial, and their application to houses and hospitals ; atmospheric pressure ; radiation and evaporation. *Heating* of houses and hospitals. *Lighting :* natural and artificial. *Hygiene* of the sick-room. *Water :* sources ; hard and soft water ; treatment of water for domestic use ; relation of impure water to the spread of disease. *Disposal of refuse :* various methods in use ; dry and water systems ; general arrangement of house and hospital drainage. *Personal hygiene :* habits ; exercise ; rest and recreation ; cleanliness ; clothing ; insects and other parasites.

Chap. 3 (p. 50).—Feeding helpless patients and children. Preparing and serving meals. *Milk :* sources of contamination, adulteration, storage, and preservation.

Chap. 4 (p. 63).—*Domestic ward management :* (*a*) methods of cleaning ; (*b*) care of furniture ; (*c*) care of bedding, linen, blankets, waterproofs ; (*d*) care of kitchen, bathroom, lavatory ; (*e*) sanitary methods of cleaning utensils,

baths, lavatories, crockery, macintoshes; (*f*) disposal and disinfection of soiled linen, dressings, &c. *General care of the patient:* (*a*) lifting and turning; (*b*) bathing, in bed, in bathroom; (*c*) care of back, hands, feet, head, hair, mouth, teeth. *Bed-making:* general and special; (*a*) operation, fracture, plaster, stump; (*b*) rheumatism, renal and cardiac. Bed sores. Filling of water-beds, water and air pillows, hot-water bottles. *Excreta:* keeping of specimens.

Chap. 5 (p. 93).—Pulse. Respiration. Temperature. Charting. Excreta.

Chap. 6 (p. 112).—Bandaging. Splints and extension.

Chap. 7 (p. 131).—Enemas, cleansing and stimulative. Care and sterilising of catheters. Oxygen apparatus.

Chap. 9 (p. 184).—Fomentations, surgical and medical. Ice bag.

Chap. 10 (p. 197).—Inhalations; steam kettle; inhaler. Common abbreviations in prescriptions. Measuring of lotions and simple drugs.

Chap. 15 (p. 253).—Bed-making for cardiac case.

Chap. 18 (p. 296).—Parasites.

Chap. 21 (p. 350).—Composition of milk. Parasites.

Chap. 22 (p. 387).—Infection; its nature, sources, and modes of transmission. Insects and other parasites. Methods of disinfection.

Chap. 29 (p. 499).—Cleansing and sterilising of instruments.

Chap. 30 (p. 536). Requirements for simple ward dressings.

II. *Re* Final Examination for the Certificate of General Nursing (England and Wales).

Chap. 3 (p. 37).—Chemical constituents of food and value of special articles of food, such as milk, butter, cheese, eggs, fish, meat, vegetables and fruits, farinaceous foods, alcohol, beverages, condiments. The feeding of children. Methods of cooking; sick-room cooking; beef-tea, soup, jelly, junket, whey, albumin water, barley water, egg dishes. Preparing and serving meals and small ward-trays. Proprietary preparations, their value and dangers. Diet in special cases of disease; in renal disease; in affections of the stomach and heart; and in diabetes.

Chap. 4 (p. 63).—Use of diet sheets and other forms. Cost and management of stores. Last offices. Case-taking on admission; reading of bed tickets; giving and receiving of reports.

Chap. 5 (p. 93).—The pulse: its rate, character, rhythm. Breathing, various types. Temperature. Urine; testing of urine.

Chap. 6 (p. 112).—Making of bandages; bandaging. Splints; splint-padding. Setting: application of splints, plasters, and extensions.

Chap. 7 (p. 131).—Purgative and stimulating enemata. Lavage and irrigation of throat, nose, ears, eyes, stomach, rectum, vagina, and bladder. Artificial feeding: œsophageal, nasal, rectal, by gastrostomy tube. Preparation for subcutaneous and intravenous infusions; continuous or "drip" enema; injections: subcutaneous, intramuscular. Aspiration, Southey's tubes, tapping, &c.; setting for lumbar puncture; preparing and cleansing apparatus. Micturition; cleansing and sterilising of catheters; passing of catheter or setting for catheterisation. Preparation for rectal and vaginal examinations. Test meals. Care of syringes and needles.

Chap. 8 (p. 166).—*Baths:* hot, cold, medicated; sponging; hot and cold packs; ice cradle; hot-air baths, local and general.

Chap. 9 (p. 181).—*Local applications:* cold and hot; poultices, linseed, mustard; fomentations, surgical and medical; filling hot-water bottles; ice-bag, and ice poultice. Counter-irritation by poultices, mustard leaves, blisters, leeches, cupping.

Chap. 10 (p. 195).—Administration of *drugs*; inhalations. Weights and measures; value of cubic centimetre, litre, gramme. Laxatives, anthelmintics, expectorants, emetics, gastric tonics, sedatives, cardiac drugs, antipyretics, diuretics, diaphoretics, hypnotics, narcotics, anæsthetics, nerve stimulants. Lotions in ward use. Poisons.

Chap. 11 (p. 220).—*General symptoms* of diseases of organs of digestion, heart, and respiratory organs.

Chap. 12 (p. 229).—*First-aid* in emergencies: hæmorrhage, fits, faints, asphyxia, shock, burns.

Chap. 13 (p. 237).—*Sepsis:* the nature, distribution, and properties of bacteria, with special reference to the part they play as the causes of fermentation, putrefaction, and infection; methods of cultivating bacteria outside the body. Infections: modes of dissemination; their spread in the body and the effect they produce (fever, toxæmia, septicæmia, pyæmia, local lesions—*e.g.*, abscess).

Chap. 14 (p. 242).—Defensive mechanism of the body. General and specific *immunity* of the body to infection. Antisera and vaccines.

Chap. 15 (p. 249).—*Diseases of the Blood and Organs of Circulation :* General symptoms of heart-disease ; features of heart failure. The pulse—its rate, character, rhythm ; œdema, anasarca, effusions ; cyanosis, fever. Treatment and nursing care. Diet in affections of the heart.

Chap. 16 (p. 259).—*Diseases of the Organs of Respiration :* General symptoms of respiratory disease ; breathing, various types ; cough : character, expectoration, pain. Treatment and nursing care of bronchitis, pneumonia, pleurisy.

Chap. 17 (p. 268).—*Diseases of the Organs of Digestion :* General symptoms : appetite, nausea, vomiting, pain, character of vomit, character of stools, state of bowels, jaundice. Treatment and nursing care. Ulcers of stomach and duodenum ; diet in stomach affections. Appendicitis. Intestinal obstruction. Disease of gall-bladder. Acute peritonitis.

Chap. 18 (p. 286).—*Diseases of Urinary Organs :* General symptoms. Treatment, nursing care, and diet in renal disease. Uræmia. Calculus. Tuberculosis. *Diseases of Skin :* symptoms ; treatment : general and local, starch poultices, inunctions. Skin diseases : eczema, psoriasis, ringworm, scabies—main features and nursing.

Chap. 19 (p. 300).—*Diseases of the Nervous System :* General features : loss of power of movement, convulsions, sensation, bladder, coma. Nursing of meningitis, paralysis, functional nervous disorders, chorea.

Chap. 20 (p. 325).—*Constitutional Diseases :* Rheumatism and joint affections ; rickets ; scurvy ; diabetes mellitus, diet in diabetes. Treatment and nursing care. *Diseases of the Ductless Glands :* Thyroid gland (myxœdema, exophthalmic goitre, goitre). Suprarenal glands. Pituitary gland.

Chap. 21 (p. 341).—Feeding and care of infant and child ; patent foods, value and dangers. Tuberculous glands.

Chap. 22 (p. 387).—*Infections :* mode of dissemination ; their spread in the body and effect (toxæmia, septicæmia, pyæmia, local lesions—*e.g.*, abscess). Precautions against spread ; methods of destroying bacteria outside the body ; disinfection of clothes and room. Treatment of fevers.

Chap. 23 (p. 403).—*Scarlet fever* and *diphtheria :* symptoms, treatment, and nursing.

Chap. 24 (p. 420).—*Enteric fevers :* ditto.

Chap. 25 (p. 429).—*Smallpox, chickenpox, measles, whooping-cough,* and *mumps :* ditto.

Chap. 26 (p. 443).—Treatment and nursing care of *pulmonary tuberculosis.*

Chap. 27 (p. 459).—*Venereal diseases*, nursing and treatment; *tetanus*.

Chap. 28 (p. 467).—Inflammation. Ulcers. Burns and scalds. Dressings: removal of stitches and clips. *Hæmorrhage:* arterial, venous, capillary; primary, recurrent, secondary; effects of hæmorrhage; arrest of hæmorrhage. Hæmophilia. New growths.

Chap. 29 (p. 493).—*Asepsis:* general principles; sterilisation by heat, by antiseptics; surgical cleanliness. *Operation theatre:* lighting; heating; ventilation; equipment; cleaning and sterilising of instruments; care of scalpels; common instruments: names, uses.

Chap. 30 (p. 514).—Preparation: of patients; of operation area; shaving. Anæsthesia. Preparation for operation in private houses. After-treatment of common operations.

Chap. 31 (p. 538).—*Common Surgical Diseases and Operations.* Operations: after-treatment; complications during and after treatment. Acute peritonitis; appendicitis; ulcers of stomach and duodenum; intestinal obstruction; empyema of thorax; cleft palate; acute mastoiditis; hernia; strangulated hernia; hæmorrhoids; diseases of the gall-bladder; of the urinary organs; of the tongue.

Chap. 32 (p. 566).—Surgical injuries, fractures, and dislocations. Surgical tuberculosis.

Chap. 33 (p. 601).—*Throat, Nose, Ear, and Eye Diseases.*—Treatment after: tonsillectomy; tracheotomy; resection of septum; removal of cataract. Special points in the various treatments: preparation of patients; appliances used. Syringing and dressing ears. Eye drops, bathing, dressing.

Chap. 34 (p. 621).—Elementary principles of treatment by massage and electricity in diseases of the nervous system.

Chap. 35 (p. 635).—*Gynæcology.*—Structure and functions of the ovaries, Fallopian tubes, uterus, vagina. Disorders of menstruation and menopause; vaginal discharges. Cystitis, treatment and nursing care. Preparation of patients for examination; douche; tampons; catheterisation. Nursing after major and minor operations.

III. *Re* Final Examination for the Certificate of Sick Children's Nursing (England and Wales).

The syllabus is the same as that for the Final Examination for the Certificate of General Nursing (England and Wales), except in the following respects:—

Chap. 7 (p. 131).—*Omit* Preparation for vaginal examination.

Chap. 18 (p. 286).—*Add* Impetigo.
Chap. 21 (p. 341).—*Add* The healthy child: mental and physical characteristics. Dentition and disorders.
Chap. 27 (p. 459).—*Add* Ophthalmia neonatorum.
Chap. 31 (p. 538).—*Omit* Hæmorrhoids and diseases of the tongue. *Add* Hare-lip, Cleft palate, and Orthopædic diseases.
Chap. 33 (p. 601).—*Add* Iridectomy.
Chap. 35 (p. 635).—*Omit* Gynæcology, except Cystitis.

IV. *Re* Final Examination for the Certificate of Fever Nursing (England and Wales).

Chap. 1 (p. 1).—Ward etiquette.
Chap. 2 (p. 9).—Warming and ventilation of wards.
Chap. 3 (p. 37).—How to prepare simple foods: whey, junket, milk jelly, peptonised milk, Benger's food, arrowroot, albumin-water, beef-tea, barley-water, Imperial drink, lemonade. Serving of invalid meals. Feeding seriously ill patients.
Chap. 4 (p. 63).—Writing ward reports; bedside reports to medical officer. Cleaning work in ward, bathrooms, &c.; care of macintoshes. Bed-making; preparation and care of water-pillows and beds; lifting and moving acute cases in bed. Preparation for and reception of new patients; bathing, dangers and precautions; blanket-bathing in bed; hair- and nail-cutting; treatment of verminous heads; care of mouth; prevention of sores about face and ears. Prevention and treatment of bed-sores. Giving bed-pans and bottles; when and how to save specimens of stools, urine, and sputum. Last offices.
Chap. 5 (p. 93).—Taking and charting pulse and respiration. Temperature-taking in axilla, mouth, rectum. Urine-testing, saving of specimens.
Chap. 6 (p. 112).—Bandaging.
Chap. 7 (p. 131).—Giving various enemata. Syringing throats; swabbing throats; spraying nose and throat; nasal douching; syringing the ear; instillation into ear; cleansing the eye; vaginal douching. Œsophageal and nasal feeding. Saline injections: rectal, subcutaneous, and intravenous; preparation for latter; giving hypodermic injections; preparation for giving antitoxic sera and vaccines. Preparation for venesection. Lumbar puncture. Preparation for passing catheter; passing female catheter. Preparation of patients for examina-

tion, including rectal and vaginal examinations. Sterilisation and care of syringes and needles. Taking blood samples.

Chap. 8 (p. 166).—Giving baths, hot and cold; packs: hot, cold, ice; hot and cold sponging; giving vapour and hot air baths, dangers.

Chap. 9 (p. 181).—Poultices, prevention of scalding; fomentations, prevention of scalding; hot-water bottles, dangers and precautions; applications of ice to head, chest, and abdomen; evaporating lotions. Blistering; counter-irritation; application of leeches.

Chap. 10 (p. 195).—Giving medicines. Use of respirators, inhalers, and insufflators. Food and medicine measures, with symbols; weights and measures. Strengths and special uses of lotions in common use. Common ward poisons; tincture of opium, morphine, belladonna, atropine, carbolic acid, perchloride of mercury, strychnine: doses, symptoms of poisoning, and treatment.

Chap. 11 (p. 220).—What to observe and report in fever cases.

Chap. 12 (p. 229).—First aid in emergencies: hæmorrhage, fits, faints, asphyxia, shock, burns. Management of cases of epistaxis and other forms of bleeding, convulsions, and foreign body in trachea.

Chap. 13 (p. 237).—Elementary facts about disease germs; taking swabs for bacteriological examination.

Chap. 14 (p. 242).—Immunity, natural and artificial. Vaccines and antisera.

Chap. 16 (p. 259).—Strapping the chest.

Chap. 21 (p. 341).—Dressing of children. Preparation of food for babies; cleaning and care of bottles.

Chap. 22 (p. 387).—*General Features of the Infective Fevers.*—The nature of the infective virus; its sources and modes of transmission. Results of infection: local lesions; the febrile state; disturbance of various systems and organs; pyrexia with its varieties. Course of fevers: incubation, development, acme, decline, convalescence. *Principles of Prevention:* Quarantine, isolation, chamber, cubicle, and barrier nursing; disposal of soiled clothing, sheets, dressings, and swabs; disinfection of typhoid stools and urine; disposal of tuberculous and pneumonic sputums; sterilisation of flasks and mugs for same; disinfection of wards and rooms. Nursing of infectious cases in private houses. *General care of fever patients:* Importance of food and water, warmth, fresh air, free action of kidneys and skin, regular motions, cleanliness, rest, and sleep. Treat-

ment and nursing of the febrile state : dieting and methods of feeding ; measures in sudden and gradual heart failure ; dyspnœa, renal inefficiency, nervous disturbance, pyrexia. rigor, irritability, insomnia, delirium, stupor, coma, post-febrile insanity.

Chap. 23 (p. 403).—*Scarlet fever :* causation, varieties, symptoms, complications, modes of death ; what to observe and report ; preventive and clinical nursing. Operations : incision of tympanum ; opening of mastoid ; drainage in empyema, in glandular abscess, in suppurating joints. *Diphtheria :* causation ; varieties : (1) *pharyngeal :* symptoms, complications, modes of death ; what to observe and report ; preventive and clinical nursing ; (2) *nasal* ; (3) *laryngeal :* symptoms ; complications ; modes of death ; what to observe and report ; management of the steam-kettle ; tracheotomy ; intubation ; nursing of cases before and after operation.

Chap. 24 (p. 420).—*Enteric fever :* causation ; varieties ; symptoms ; complications ; care in moving patient in bed ; position of patient ; modes of death ; what to observe and report ; preventive and clinical nursing ; precautions against self-infection ; operations for perforation.

Chap. 25 (p. 429).—*Smallpox :* causation ; varieties ; symptoms ; complications ; modes of death ; what to observe and report ; preventive measures ; vaccination ; clinical nursing. *Chickenpox :* causation ; varieties ; symptoms ; complications ; preventive and clinical nursing. *Measles :* causation ; varieties ; symptoms ; complications ; modes of death ; what to observe and report ; preventive and clinical nursing. *Rubella :* outline of clinical facts and nursing. *Cerebro-spinal Fever :* causation ; varieties ; symptoms ; complications ; modes of death ; lumbar puncture ; what to observe and report ; preventive and clinical nursing. *Whooping-cough :* causation ; varieties ; symptoms ; complications ; modes of death ; what to observe and report ; preventive and clinical nursing. *Mumps and Influenza :* outline of clinical facts and nursing.

Chap. 27 (p. 459).—*Venereal Diseases :* brief outline of their nature and management. *Erysipelas :* outline of clinical facts and nursing.

Chap. 29 (p. 493).—*Surgical asepsis :* sterilisation of instruments ; care of sterilisers. Common surgical instruments.

Chap. 30 (p. 514).—Outlines of *theatre work* ; preparation of patient, &c., for such operations as are likely to be performed in a fever hospital ; preparation for giving anæsthetics, general and local.

Chap. 31 (p. 538).—*Operations :* drainage in empyema ; opening of mastoid.

Chap. 33 (p. 601).—Instillation of drops into the eye ; application of ointments to the eye ; application of dressings to the eye. Preparation for examining eye, throat, nose, and ear. Tracheotomy.

Chap. 36 (p. 668).—Care of new-born infants.

Puerperal Fever : causation, varieties, symptoms, complications, modes of death ; vaginal douching ; preparation of patient for operation ; what to observe and report ; nursing ; prevention.

For Hospitals in which Tuberculosis Patients are Treated.

Chap. 16 (p. 259).—Tuberculous Laryngitis.

Chap. 17 (p. 284).—Tuberculous Peritonitis.

Chap. 18 (p. 290).—Genito-urinary Tuberculosis.

Chap. 19 (p. 305).—Tuberculous Meningitis.

Chap. 21 (p. 381).—Tuberculous Lymphadenitis.

Chap. 26 (p. 443).—Tuberculosis : causation ; varieties of tubercle bacillus ; tubercle formation ; predisposing causes ; invasion.

Pulmonary Tuberculosis : classification ; symptoms ; complications ; pleurisy and pleural effusion, empyema, pneumo-thorax, hæmoptysis, mental derangement, suicide ; treatment : educational, dietic, medicinal, surgical (aspiration of chest, artificial pneumo-thorax, draining of empyema).

Principles of Sanatorium Treatment : open air ; rest (absolute, partial) ; feeding ; graduated exercises and work (auto-inoculation) ; tuberculin. Value of temperature, pulse, and respiration records as guides to treatment. Treatment of tuberculous patients at home.

Chap. 32 (p. 581).—Tuberculosis of Bone and Joints : treatment, special appliances.

V. *Re* Preliminary Examination (Scotland).

(General Nursing, Sick Children's Nursing, and Fever Nursing.)

Chap. 1 (p. 1).—Ethical aspects ; hospital etiquette ; relation of nurse to patients, doctors, and fellow-nurses. Personal hygiene : clothing, uniform.

Chap. 2 (p. 9).—*Air :* its composition and impurities ; principles of ventilation, and their application to houses and hospitals ; ward ventilation ; radiation and evaporation. *Heating* and *Lighting* of houses and hospitals ; ward heating. *Hygiene* of the sick-room. *Water :* sources ; standard of purity for domestic use ; relation of impure water to the spread of disease. *Disposal of refuse :* methods in use ; principles involved in conservancy and water-carriage systems ; general arrangements of house drainage, and for disposal of sewage on a large scale. *Personal hygiene :* habits ; exercises ; rest and recreation ; cleanliness ; clothing ; parasites.

Chap. 3 (p. 37).—Classification, nature, and uses of *food stuffs :* proximate principles and their uses ; diseases connected with insufficient and faulty dietary ; nutritive values. Metabolism. Composition of dietaries ; composition of common articles of food. Deficiency diseases and their causes. *Cooking* (introductory to a practical course) : effect of heat variously applied. Special nursing points in feeding.

Chap. 4 (p. 63).—Ward-work : ward cleaning ; linen and bedding ; economy in the use of hospital property. Bed-making ; water-beds and cushions. Care of patients ; blanket-bathing ; cleaning of mouth and hair ; care of back ; bed-sores ; keeping of specimens. Care of the dead.

Chap. 5 (p. 93). –Pulse. Respiration. Temperature. Charting.

Chap. 6 (p. 112).—Bandaging demonstrations.

Chap. 9 (p. 181).—Local applications : cold, hot.

Chap. 10 (p. 195).—Administration of medicines, various methods ; weights and measures. Poisons.

Chap. 11 (p. 220).—Observation of the patient.

Chap. 18 (p. 286) and **Chap. 21** (p. 341).—Infestation, internal and external.

Chap. 22 (p. 387).—Methods of infection. Insects and other parasites. Infection and disinfection.

VI. *Re* Final Examination for the Certificate of General Nursing (Scotland).

Chap. 3 (p. 37).—*Dietetics and Cooking :* milk, butter, cheese, &c. ; eggs, fish, meat, fresh *versus* stale ; vegetables, farinaceous foods, fruits, alcohol ; beverages ; condiments. Diets in special diseases. Methods of cooking. Predigested foods. Feeding of patients. Course of demonstrations and practical classes.

Chap. 4 (p. 63).—Bed-sores. Excreta.

Chap. 5 (p. 93).—The pulse: its rate, character, rhythm. Dyspnœa: stridulous, asthmatic, catching breathing. Charts. Urine.

Chap. 6 (p. 112).—Splints and extension.

Chap. 7 (p. 131).—Syringing throat, nose, ears; bathing eyes; lavage of stomach, rectum, and bladder; douching. Artificial feeding; predigested foods. Hypodermic injections. Aspirator; Southey's tubes. Micturition; catheterisation; care of catheters. Preparation for examination of abdomen, vagina, and rectum. Test meals.

Chap. 8 (p. 166).—Baths; packs; sponging; hot-air baths.

Chap. 9 (p. 181).—Counter-irritants; leeches; cupping.

Chap. 10 (p. 195).—*Materia Medica and Therapeutics:* Laxatives, &c.; anthelmintics; expectorants; emetics; cardiac drugs, &c.; antipyretics; diuretics; diaphoretics; hypnotics; narcotics; anæsthetics; nerve stimulants; uterine stimulants. More important preparations of the more important drugs with their dosage; special attention to hypodermic doses; symptoms of over-dosage. Other therapeutic measures. *Intoxicants and Poisons:* Acute poisoning: symptoms and antidotes. Corrosives: strong acids, alkalines, and caustic salts; irritants; non-irritants; gas; poisoning from food. Treatment. Alcohol; chronic lead poisoning; morphine and other drug habits.

Chap. 11 (p. 220).—Observation of the patient. Excreta; sputum. General symptoms of diseases of organs of digestion, heart, and respiratory organs.

Chap. 12 (p. 229).—*First-aid* in emergencies: hæmorrhage; fits; faints; shock; burns.

Chap. 13 (p. 237).—*Bacteriology:* The nature, distribution, and properties of bacteria, with special reference to the part which they play as the causes of fermentation, putrefaction, and infection (suppuration, tuberculosis, enteric fever, &c.) Precautions to be taken in procuring and transmitting specimens intended for bacteriological examination. Methods of cultivating and of destroying bacteria outside the body (sterilisation by heat, antiseptics, &c.) Infections, modes of dissemination, their spread in the body, and the effects which they produce (toxæmia and fever, local lesions—*e.g.*, abscess, pyæmia, and septicæmia).

Chap. 14 (p. 242).—Methods of defence against *infection* shown by the living body, general and specific (immunity). Special methods designed to aid such defence: antisera

and vaccines, their application in the prevention and treatment of infections.

Chap. 15 (p. 249).—*Diseases of the Organs of the Circulation and of the Blood:* General symptoms of heart-disease; features of heart failure; the pulse—its rate, character, rhythm; œdema, dropsy, anasarca; effusions; cyanosis; fever. Instruments used in diagnosis and treatment. Therapeutics.

Chap. 16 (p. 259).—*Diseases of the Organs of Respiration:* General symptoms of respiratory disease. Breathing: types; dyspnœa, stridulous, asthmatic, catching. Cough: character and frequency, expectoration, pain. Instruments. Therapeutics.

Chap. 17 (p. 268).—*Diseases of the Organs of Digestion:* General symptoms: appetite; nausea; vomiting; character of vomit; state of bowels; examination and character of stools; defæcation, jaundice. Instruments. Therapeutics.

Chap. 18 (p. 286).—*Diseases of the Urinary Organs:* General symptoms; urine. Instruments. Therapeutics. *Diseases of the Skin:* Lesions and symptoms of skin affections; general treatment, internal, external; diagnosis and prognosis. Skin diseases of most importance: their main features and nursing.

Chap. 19 (p. 300).—*Diseases of the Nervous System:* General features: loss of power of movement; sensation; bladder; bed-sores; convulsions; coma. Instruments. Therapeutics.

Chap. 20 (p. 325).—*Constitutional Diseases and Diseases of the Ductless Glands:* Rheumatism and joint affections: general features. Therapeutics. Deficiency diseases and their causes: scurvy; rickets. Diabetes mellitus: general symptoms. Thyroid gland: goitre; exophthalmic goitre; myxœdema; general features. Thymus gland. Suprarenal glands.

Chap. 21 (p. 341).—Infant feeding; proprietary preparations, their value and dangers. Nursing and feeding of sick children. Intestinal parasites: symptoms and treatment.

Chap. 22 (p. 387).—*Infections*, modes of dissemination, their spread in the body and the effects which they produce (toxæmia and fever, local lesions—*e.g.*, abscess, pyæmia, and septicæmia). Precautions against spread of fevers; disinfection of patients' clothes and room. Treatment of fevers.

Chap. 23, 24, 25 (pp. 403, 420, 429).—*Infectious Diseases:* symptoms and treatment of fevers; special diets; special treatments.

Chap. 26 (p. 443).—*Pulmonary tuberculosis.*

Chap. 27 (p. 459).—*Venereal diseases. Erysipelas.*

Chap. 28 (p. 467).—Inflammation; Bier's suction cups. Toxæmia, septicæmia, pyæmia. Ulcers. Burns and scalds. Hæmorrhage: arterial, venous, capillary; effects of hæmorrhage; arrest of hæmorrhage; artificial arrest of hæmorrhage. Tumours: simple (benign) and malignant.

Chap. 29 (p. 493).—General principles of *asepsis:* germs; antiseptics; sterilisation; surgical cleanliness. *Operation theatre:* lighting, heating, ventilation, furnishings, equipment; requisites for operator; preparation of the hands for theatre assistance; instruments.

Chap. 30 (p. 514).—Preparation of patients for *operation*; preparation of operation area. Anæsthetics: general, local, special. Duties of nurse acting as surgeon's assistant.

Chap. 31 (p. 538).—*Common surgical diseases:* operations; after-treatment; complications during and after treatment. Acute peritonitis; appendicitis; ulcers of stomach and duodenum; perforation of ulcers of stomach and duodenum; rupture of stomach or intestine by violence; intestinal obstruction; pyloric contraction; empyema of thorax; acute mastoiditis; hernia; strangulated hernia; hæmorrhoids; diseases of gall-bladder; of urinary organs; of tongue.

Chap. 32 (p. 566).—*Fractures*, dislocations, and injuries. *Surgical tuberculosis. Deformities:* (1) occurring before birth; (2) occurring at birth; (3) acquired after birth.

Chap. 33 (p. 601).—Nursing of *Throat, Nose, Ear,* and *Eye* cases. Tracheotomy.

Chap. 34 (p. 621).—*Massage and Exercises:* general principles and therapeutic uses; massage in treatment of nerve cases. *Medical Electricity:* general principles and therapeutic uses; use in diagnosis and treatment of nerve cases.

Chap. 35 (p. 635).—*Structure and Function of the Generative Organs:* Ovaries, Fallopian tubes; uterus, and vagina. Conception, fertilisation of ovum; fœtal development; ante-natal conditions. *Diseases of Generative Organs:* Disorders of menstruation and menopause; inflammatory lesions of genital organs; displacements; tumours; abnormal pregnancy; injuries produced by child-birth. Preparation of patient for examination with special reference to posture; douching; tampons; catheterisation; pessaries. Instruments in common use in gynæcological operations and examinations; preparation of patient and room for minor operation, such as curetting; nursing after the major and minor gynæcological operations.

Chap. 36 (p. 669).—The toxæmias of pregnancy. Abortion.

VII. *Re* Final Examination for the Certificate of Sick Children's Nursing (Scotland).

Chap. 3 (p. 37).—*Dietetics* and *Cooking :* milk, butter, cheese, &c. ; eggs, fish, meat, fresh *versus* stale ; vegetables, farinaceous foods, fruits, alcohol ; beverages ; condiments. Diets in special diseases. Methods of cooking. Course of demonstration and practical class. Feeding of patients.

Chap. 4 (p. 63).—Special beds for rheumatism, nephritis, &c. Excreta.

Chap. 5 (p. 93).—Types of breathing. Ward records of temperature, pulse, respiration, vomiting, fits, motions, urine, sleep, delirium, taking food, crying, &c.

Chap. 6 (p. 112).—Splints and extension.

Chap. 7 (p. 131).—Different kinds of enemata. Syringing throat, nose, ears ; bathing eyes ; lavage of stomach, rectum, and bladder ; douching. Artificial feeding ; predigested foods. Hypodermic injections ; giving of serum or vaccines. Aspirator ; Southey's tubes. Micturition ; catheterisation ; care of catheters. Preparation for examination of rectum. Test meals. Precautions to be taken in procuring and transmitting specimens intended for bacteriological examination.

Chap. 8 (p. 166).—*Baths* and *packs* ; methods of giving cold, neutral, and hot baths and packs ; sponging ; hot-air baths ; methods of giving electric light baths. Reasons and methods of giving mustard, sulphur, bran, bicarbonate of soda, salt, and other baths.

Chap. 9 (p. 181).—Counter-irritants ; leeches ; cupping.

Chap. 10 (p. 195).—*Materia Medica and Therapeutics* (general principles) : Laxatives, &c., anthelmintics ; expectorants ; emetics ; cardiac drugs ; antipyretics ; diuretics ; diaphoretics ; hypnotics ; narcotics ; anæsthetics ; nerve stimulants. Dosage in relation to children ; special attention to hypodermic doses. *Poisons :* Acute poisoning : symptoms and antidotes ; stomach-pump. Poisoning from food ; treatment.

Chap. 11 (p. 220).—Observation of patient ; excreta ; sputum.

Chap. 12 (p. 229).—*First-aid* in emergencies : hæmorrhage, fits, faints, shock, burns.

Chap. 13 (p. 237).—*Bacteriology.*—The nature, distribution, and properties of bacteria, with special reference to the part they play as the causes of fermentation, putrefaction, and infection (suppuration, tuberculosis, enteric

fever, &c.) Methods of cultivating and of destroying bacteria outside the body (sterilisation by heat, antiseptics, &c.) Infections: modes of dissemination, their spread in the body, and the effects which they produce (toxæmia and fever, local lesions—*e.g.*, abscess, pyæmia, and septicæmia).

Chap. 14 (p. 242).—Methods of defence against *infection* shown by the living body, general and specific (immunity). Special methods designed to aid such defence: antisera and vaccines, their application in the prevention and treatment of infections; giving of serums and vaccines; serum rashes.

Chap. 15 (p. 249).—*Diseases of the Heart.*

Chap. 16 (p. 259).—*Diseases of the Organs of Respiration:* General symptoms; types of breathing. Examples: bronchitis, acute broncho-pneumonia, pneumonia, empyema; indications for treatment. Laryngitis.

Chap. 17 (p. 268).—Defæcation and examination of stools. Jaundice; acute peritonitis; tuberculous abdomen.

Chap. 18 (p. 286).—Nephritis; pyelitis. Eczema, impetigo, ringworm, scabies: their spread and prevention.

Chap. 19 (p. 300).—Meningitis; infantile paralysis; fits; chorea; hysteria.

Chap. 20 (p. 325).—Rheumatic diseases; rickets; scurvy; cretinism; diabetes.

Chap. 21 (p. 341).—*Physiology of Children:* weight, size, fontanelles, intelligence, walking, speech, playing, teeth. Feeding healthy baby: physiology of digestion; mother's milk; cow's milk, feeding by bottle; other foods. Crying. Stools. Weight record.

Nursing and feeding of *sick children*; observation of patient; clothing; keeping in bed. Diarrhœa, prevention of spread; constipation; colic; vomiting; pyloric stenosis; wasting; intussusception; worms; cœliac disease. Congenital heart-disease. Croup. Habits. Mental defects: signs and examples: mania, melancholia. Mongolism. Hare-lip; cleft palate. Incontinence of urine, treatment.

Chap. 22 (p. 387).—*Infections*, modes of dissemination, their spread in the body and the effects which they produce (toxæmia and fever, local lesions—*e.g.*, abscess, pyæmia, and septicæmia).

Chap. 23 (p. 403).—*Scarlet fever:* period of incubation, rash. *Diphtheria:* period of incubation, paralysis, tracheotomy.

Chap. 24, 25 (pp. 420, 429).—Various infectious diseases: periods of incubation, rashes.

Chap. 26 (p. 443). *Tuberculous diseases :* general nature ; infection ; diet ; nursing in the open air.

Chap. 27 (p. 459).—*Syphilis.*—Vulvo-vaginitis ; eye effections.

Chap. 28 (p. 467).—Inflammation : general causes, local causes ; the phenomena of inflammation ; Bier's suction cups. Toxæmia, septicæmia, pyæmia. Burns and scalds. Wounds. Hæmorrhage : arterial, venous, capillary ; effects ; arrest ; artificial arrest. Shock. Tumours : simple (benign) and malignant.

Chap. 29 (p. 493).—*Surgical cleanliness :* germs ; antiseptics ; sterilisation ; asepsis ; use of antiseptics ; indications for the choice of asepsis ; disinfection of hands. *Operating theatre :* preparation, lighting, heating, ventilation, and equipment. Instruments ; dressings ; rubber goods ; cleaning and sterilisation of utensils.

Chap. 30 (p. 514).—Preparation of patient for *operation.* Anæsthetics, general and local. Condition and care of patient after operation ; special points in the care of patients after operation for abdominal infection.

Chap. 31 (p. 538).—*Common surgical diseases and malformations :* operations and after-treatment. Appendicitis ; acute peritonitis ; pyloric stenosis ; intussusception ; empyema of thorax ; acute mastoiditis ; hernia ; hare-lip ; cleft palate ; operations on head and spine ; excision of hip, knee, elbow.

Chap. 32 (p. 566).—*Fractures :* dislocations ; surgical tuberculosis. *Deformities :* (1) occurring before birth ; (2) occurring at birth ; (3) acquired after birth. Talipes ; congenital dislocation of hip, &c. ; splints for paralysis, for rickets.

Chap. 33 (p. 601).—Tonsilitis ; removal of enlarged tonsils and adenoids ; tracheotomy. Nursing of ears and eyes, &c.

Chap. 34 (p. 630).—Method of giving electric-light baths ; preparation for X-rays.

Chap. 35 (p. 650).—Cystitis.

VIII. *Re* Final Examination for the Certificate of Fever Nursing (Scotland).

Chap. 3 (p. 37).—*Dietetics* and *Cooking :* Milk, butter, cheese, &c. ; eggs, fish, meat, fresh *versus* stale ; vegetables, farinaceous foods, fruits ; alcohol, beverages ; condiments. Diets in special diseases. Methods of cooking. Predigested foods. Feeding of patients. Course of demonstration and practical classes. Milk-borne diseases.

Chap. 4 (p. 63).—Excreta.

Chap. 5 (p. 93).—Collection, preservation, and testing of urine.
Chap. 6 (p. 112).—Splints and extension.
Chap. 7 (p. 131).—Syringing throat, nose, ears; bathing eyes; lavage of stomach, rectum, and bladder; douching. Artificial feeding; predigested foods. Hypodermic injections. Aspirator; Southey's tubes. Preparation for lumbar puncture. Micturition; catheterisation; care of catheters. Preparation for rectal examination. Test meals. Precautions to be taken in procuring and transmitting specimens intended for bacteriological examination.
Chap. 8 (p. 166).—Baths; packs; sponging; hot-air baths. Management of hyperpyrexia.
Chap. 9 (p. 190).—Counter-irritants; leeches; cupping.
Chap. 10 (p. 195).—The more important *drugs* in use in fever hospitals, with their dosage; their classification; special attention to be given to hypodermic injection and symptoms of over-dosage. *Poisons:* symptoms and treatment of acute poisoning—*e.g.*, opium and strychnine, with special reference to poisoning by the strong acids, carbolic acid, corrosive sublimate.
Chap. 11 (p. 220).—Observation of patient; excreta; sputum.
Chap. 12 (p. 229).—*First-aid* in emergencies: hæmorrhage; fits; faints; shock; burns.
Chap. 13 (p. 237).—*Bacteriology:* nature, products, and results of action of bacteria; conditions which favour or inhibit their growth and reproduction; methods of destroying them: sterilisation by heat, antiseptics, and disinfectants.
Chap. 14 (p. 242).—*Immunity:* the reaction of the human body to infection; natural and acquired immunity; the use of vaccines and serums. Susceptibility and anaphylaxis.
Chap. 15 (p. 249).—Endocarditis. Management of heart failure.
Chap. 16 (p. 259).—Laryngitis, bronchitis, pleurisy, empyema, pneumonia; principal facts.
Chap. 17 (p. 268).—Management of vomiting. Defæcation and examination of stools. Peritonitis.
Chap. 18 (p. 286).—Nephritis; management of renal insufficiency. Contagious *skin diseases:* ringworm, favus, and scabies.
Chap. 19 (p. 300).—Management of convulsions.
Chap. 21 (p. 341).—Nursing and feeding of *sick children*. Prolapse of rectum. Tuberculous adenitis.
Chap. 22 (p. 387).—*Infection:* sources of infection: patients or carriers; modes of transmission; contact infection.

Water and the water-borne diseases; milk and other articles of food and the milk-borne diseases; insects and the diseases transmitted by them; fomites; air and dust. The diseases particularly associated with human carriers. *Fever* and the febrile state: the production, loss, and regulation of heat in the normal body; pyrexia; symptoms of fever; management of delirium and rigors; the course of fevers: periods of incubation, invasion, acme, defervescence, and convalescence; management of rigors. Principles of *prevention:* notification, disinfection, quarantine, and isolation. Special methods of isolation: cubicle and barrier nursing; bed isolation. Disposal of excreta. Nursing in private houses. *Disinfection:* sterilisation by heat, antiseptics, and disinfectants. *General care* of fever patients; what to observe and report in nursing of fever cases, with special reference to the management of heart failure, dyspnœa, renal insufficiency, rigors, hyperpyrexia, vomiting, convulsions, insomnia, delirium, and nervous symptoms.

Chap. 23 (p. 403).—*Scarlet fever* and *diphtheria:* causation, incubation period, prodromal symptoms, course, defervescence, types, complications, sequelæ, treatment and management, and isolation and quarantine periods.

Chap. 24 (p. 420).—*Enteric fever:* ditto.

Chap. 25 (p. 429).—*Smallpox, chickenpox, measles, whooping-cough,* and *influenza:* ditto. Inoculation and vaccination. *Typhus fever, rubella, cerebro-spinal fever, encephalitis lethargica,* and *mumps:* a less detailed account of the principal facts.

Chap. 26 (p. 443).—*Tuberculosis:* causation; varieties of bacilli; medical tuberculosis, course and treatment.

Chap. 27 (p. 459).—*Venereal diseases:* ophthalmia neonatorum. *Erysipelas.*

Chap. 28 (p. 467).—Inflammation; abscess; Bier's suction cups. Hæmorrhage and its arrest.

Chap. 29 (p. 493).—*Germs:* surgical cleanliness; asepsis and antiseptics; sterilisation. The simpler surgical instruments; dressings.

Chap. 30 (p. 514).—General preparation of patient for *operation.* After-care.

Chap. 31 (p. 538).—Preparation for such operations as perforation of bowel, empyema, suppurating ears, and suppurating glands.

Chap. 32 (p. 566).—Surgical tuberculosis.

Chap. 33 (p. 601).—Tonsilitis. Preparation for tracheotomy.

Chap. 36 (p. 669).—Puerperal septicæmia.

APPENDIX II.

EXAMINATION QUESTIONS.

The following questions, which include all those set to June 1927 at the examinations of the General Nursing Council of England and Wales for the Certificates of General Nursing, Sick Children's Nurses, and Fever Nursing, are classified according to chapter, and reference is given to the pages on which the answers may be found.

CHAPTER I.

1. What are the necessary qualifications to make an ideal nurse ? (P. 3.) (*Preliminary.*)
2. What steps would you take to procure the necessary "quietness" when in attendance upon the sick ? (P. 4.) (*Preliminary.*)
3. What hygienic principles should a nurse follow to keep herself in perfect health ? (Pp. 7, 30-34.) (*Preliminary.*)
4. How would you aim at keeping fit and well on night duty ? (Pp. 7, 30-34.) (*Preliminary.*)

CHAPTER II.

1. What do you mean by hygiene ? (P. 10.) (*Preliminary.*)
2. What do you understand by the term atmosphere ? (P. 10.) (*Preliminary.*)
3. What is the composition of air ? Of what importance are the elements you mention in sustaining life ? (P. 10.) (*Preliminary.*)

4. What is the composition of air, and what is the difference between inspired and expired air ? (P. 10.) (*Preliminary.*)

5. What do you understand by the term ventilation ? (P. 11.) (*Preliminary.*)

6. What changes take place in air in an overcrowded lecture-room ? What effect has this air on the audience ? (P. 12.) (*Preliminary.*)

7. In what ways is pure air rendered impure in a sick-room ? (Pp. 10, 12.) (*Preliminary.*)

8. What is cubic space, and what is the average required for a sick person ? Mention some of the ill-effects of overcrowding with which a nurse may have to deal. (Pp. 14, 12-13.) (*Preliminary.*)

9. What do you mean by ventilation ? By what *natural* method can you procure good ventilation in (*a*) a room ; (*b*) a hospital ward ? (Pp. 11, 14-16.) (*Preliminary.*)

10. What procedure would you adopt in maintaining good ventilation in a ward throughout the hours of duty ? (P. 16.) (*Final, General.*)

11. What do you mean by atmospheric pressure ? (P. 17.) (*Preliminary.*)

12. What is meant by (*a*) radiation of heat, (*b*) conduction of heat, (*c*) convection of heat ? Give an example of each. Give the different methods by which a hospital ward may be heated. (Pp. 12, 18-19.) (*Scot. Preliminary.*)

13. Describe the different methods of heating and lighting a hospital ward. Compare the merits of each method. (Pp. 18-21.) (*Scot. Preliminary.*)

14. What do you mean by centigrade (thermometer scale) ? (P. 19.) (*Preliminary.*)

15. What do you understand by centigrade and fahrenheit thermometers ? (P. 19.) (*Final, General.*)

16. How would you ventilate a sick-room to the best advantage ? (Pp. 21-22.) (*Preliminary.*)

17. Enumerate the sources of a water supply, and mention the advantages or disadvantages of each. (P. 23.) (*Scot. Preliminary.*)

18. What are the natural sources of a water supply ? How is water collected and rendered fit for use ? If suspicious, how may it be treated for individual use ? (Pp. 23, 25.) (*N. Ireland, Preliminary.*)

19. Briefly describe the term hardness of water. (P. 24.) (*Preliminary.*)

20. How would you treat very hard water to render it suitable for cleansing purposes ? (P. 24.) (*Preliminary.*)

21. What diseases may be transmitted by water ? In what other ways is impure water dangerous to the public ? (P. 25.)
(*Preliminary.*)

22. How is the water of a shallow well likely to become contaminated ? What precautions could be taken to make such a water safe for drinking purposes ? (Pp. 23, 25.)
(*Scot. Preliminary.*)

23. How is the water of shallow wells liable to become polluted ? What diseases have been produced through the use of such water ? (Pp. 23, 25.) (*Final, General.*)

24. Give the name of any one domestic filter which prevents the passage of disease-producing germs. State (*a*) what it is constructed of ; (*b*) how the water passes through it ; (*c*) what precautions you would take to keep such a filter clean. A rough sketch may be used to illustrate your answer. (Pp. 26, 8.)
(*Scot. Preliminary.*)

25. What do you mean by hospital refuse ? What methods do you know of to dispose of hospital refuse ? (P. 26.)
(*Preliminary.*)

26. How are food refuse and soiled dressings dealt with in a hospital ward ? (P. 26.) (*Final, General.*)

27. What should be the temperature of the following baths : tepid, warm, hot, vapour ? (P. 31.)
(*N. Ireland, Preliminary.*)

28. Discuss the importance of clothing in relation to health. State your views as to the materials and colours suitable for hot and cold climates respectively, and give your reasons for what you recommend. (Pp. 32-33.) (*Scot. Preliminary.*)

29. How would you deal with a case of pediculosis of the body and of the clothes ? (Pp. 35, 77.)
(*Final, Children's.*)

30. What do you understand by sequelæ ? (P. 36.)
(*Final, Fever.*)

CHAPTER III.

1. What do you mean by carbohydrates ? (P. 37.)
(*Preliminary.*)

2. How do you know if an egg is fresh before breaking it ? Name the various ways in which eggs can be prepared for an invalid. Choose one method and describe in detail how you would carry out the preparation. What food constituents does an egg contain ? (Pp. 39, 47.) (*Scot., Final, Fever.*)

3. What do you understand by the term glucose ? (P. 43.)
(*Final, Children's.*)

4. What are the advantages of cooking of meat ? Compare the effects of roasting and boiling. (Pp. 44-45.)
(*Scot., Preliminary.*)

5. What do you understand by the term white wine whey ? (P. 46.) (*Final, Children's.*)

6. What do you mean by peptonised milk, and how would you prepare this ? (P. 47.) (*Preliminary.*)

7. State a few general rules to be followed in the feeding of the sick. How would you prepare whey, peptonised milk, albumin water ? (Pp. 50, 46-47.) (*Final, Fever.*)

8. How do you prepare the following : peptonised milk, junket, milk jelly, albumin water, beef-tea, barley-water ? (Pp. 46-50.) (*Final, Fever.*)

9. How would you prepare whey, albumin water, barley-water, beef-tea ? (Pp. 46-50.) (*Final, General.*)

10. How would you cook and serve a custard for an invalid ? What food constituents does a custard contain ? (Pp. 47, 38-39.)
(*Scot., Final, Fever.*)

11. What is the use of beef-tea ? (Pp. 49, 54.)
(*Scot., Final, Mental.*)

12. What points would you observe (*a*) in the serving of food to, and (*b*) the feeding of, an adult patient who is unable to feed himself ? (P. 50.) (*Preliminary.*)

13. What points would you attend to (*a*) in the feeding of a helpless patient, (*b*) in the serving of meals to a convalescent patient ? (P. 50.) (*Scot. Preliminary.*)

14. How would you (*a*) prepare food for, and (*b*) feed, a helpless paralysed patient ? (P. 50.) (*Preliminary.*)

15. What infectious diseases may be conveyed by milk ? Give a brief account of the methods by which milk may have become infected in each of these diseases. (Pp. 51-53.)
(*Final, Fever.*)

16. How would you ensure a pure milk supply ? Mention some of the diseases that may be conveyed by contaminated milk. (P. 51-53.) (*Preliminary.*)

17. In what way can cow's milk be contaminated after leaving the dealer ? How would you store this milk in a private house previous to use ? (P. 53.) (*Preliminary.*)

18. What would you do on receiving your daily supply of milk to keep it fresh and prevent contamination in any way ? (P. 53.) (*Preliminary.*)

19. State your duties regarding the receiving and care of your daily milk supply. (P. 53.) (*Preliminary.*)

20. Briefly describe calories. (P. 55.) (*Preliminary.*)

21. What do you understand by the term calorie ? (P. 55.)
(*Final, Children's.*)

22. What do you understand by a mixed diet, and what are its advantages? What is meant by the term "calorie," and what bearing have age, sex, climate, and type of work performed on the calorific requirements of an individual? (Pp. 55-57.) (*Scot., Preliminary.*)

23. What foods must be excluded from, or restricted in, the diet of patients suffering from (*a*) mitral disease, (*b*) diabetes? (Pp. 57, 61.) (*Scot., Final, General.*)

24. Outline a dietary for a patient suffering from dilatation of the heart. (P. 57.) (*Scot., Final, General.*)

25. What foods would you avoid in nephritis and diabetes, and why? (Pp. 60, 61.) (*Scot., Final, General.*)

CHAPTER IV.

1. What are the nurse's duties regarding the care of the various utensils kept in (*a*) ward kitchen; (*b*) bathroom; (*c*) lavatory? (P. 63.) (*Preliminary.*)

2. Give in detail the reason for and method of cleaning ward furniture, bedding and bed macintoshes, feeding utensils, sanitary utensils. (Pp. 63-65.) (*Preliminary.*)

3. How would you cleanse after use (*a*) various drinking vessels; (*b*) male urinals? (P. 64.) (*Preliminary.*)

4. What steps can a nurse take to prevent waste of various kinds in hospital? (P. 65.) (*Final, General.*)

5. What procedure would you adopt (*a*) in the economical care and preservation of ward linen; (*b*) in preventing waste of bread? (Pp. 65-66.) (*Final, General.*)

6. How would you dispose of (*a*) soiled or infected linen on removal from bed, and (*b*) soiled dressings? (Pp. 69, 77, 26.) (*Preliminary.*)

7. What points do you attend to in preparing a water-bed? (P. 72.) (*Scot. Preliminary.*)

8. What are the necessary precautions to take in bathing a new patient in the bathroom? (P. 74.) (*Preliminary.*)

9. Give a detailed description of how a bed-bath should be given. (P. 75.) (*Preliminary* and *Final Fever.*)

10. Give in detail the method by which you would proceed to bath in bed a patient who is too ill to go to the bath. (P. 75.) (*Preliminary.*)

11. Name the common parasites which may be met with on the head and body of a child. Write what you know of their habits and the diseases to which they give rise. (Pp. 34, 76, 298.) (*Final, Children's.*)

12. Describe fully how you would deal with a verminous head newly admitted to a children's ward. What local complications may result from this condition ? (P. 76.)
(*Final, Fever.*)

13. When cleaning a verminous head, how would you prevent infection of (*a*) yourself, (*b*) others ? (P. 76.)
(*Preliminary.*)

14. What precautions would you take to prevent the spread of infection if a verminous patient were admitted to a hospital ward ? (Pp. 76-77.) (*Final, General.*)

15. A tramp suffering from acute bronchitis and in a verminous condition is brought into the ward. How would you undress him, and how would you deal with his clothing ? (P. 77.) (*Final, General.*)

16. How would you deal with a case of pediculosis of (*a*) the hair ; (*b*) the clothes ; (*c*) the body ? (Pp. 76-77, 35.)
(*Final, Children's.*)

17. Why should you attend to the mouth of a very sick patient ? Give your method of so doing. What complications does a dirty mouth produce ? (P. 78.)
(*Preliminary.*)

18. How would you proceed to cleanse the mouth and teeth of a sick person ? Why should it be necessary to do this ? (P. 78.) (*Preliminary.*)

19. What is meant by " the toilet of the mouth " ? Why is it so important in Fever Nursing ? How would you carry it out ? (P. 78.) (*Final, Fever.*)

20. What means are taken to prevent bed-sores ? How would you prevent such a condition arising ? (P. 79.)
(*Preliminary.*)

21. What do you mean by bed-sores ? How would you prevent such a condition arising ? (P. 79.)
(*Preliminary.*)

22. What means are taken to prevent bed-sores ? Give carefully the reason for each measure. (P. 79.)
(*Final, General.*)

23. What are the different pressure points of the body, and the care to be observed in the prevention of bed-sores ? (P. 79.)
(*Preliminary.*)

24. What do you mean by a bed-sore ? How would you prevent the same in a patient lying in the same position for six weeks ? (P. 79.) (*Preliminary.*)

25. In a bedridden case of a chronic disease, state what are the common complications. Describe the nursing measures you would take to avoid these. (Pp. 79, 267, 273, 586.)
(*Final, General.*)

26. What measure may be taken to induce a patient to pass urine before resorting to catheterisation ? How would you save and prepare a specimen of urine from a twenty-four hours' collection ? (Pp. 82-84.) (*Final, Fever.*)

27. What do you understand by the " keeping of specimens"? (P. 84.) (*Preliminary.*)

28. How would you collect and put up specimens of (*a*) urine, (*b*) fæces ? (P. 84.) (*Final, Fever.*)

29. What are your duties with regard to procuring a specimen of urine (*a*) for ward examination, (*b*) for laboratory examination ? (Pp. 84, 163.) (*Preliminary.*)

30. Describe the duties of a night nurse in charge of a surgical ward. (P. 87.) (*Final, General.*)

31. What observations would you make and report to the sister-in-charge on receiving a new patient into the ward ? (P. 87.) (*Preliminary.*)

32. What would be your duties as a nurse in charge of a ward in the case of a patient admitted following a street accident ? (Pp. 88-89.) (*Final, Children's.*)

33. (*a*) A child whose abdomen has been run over has been admitted to your ward accompanied only by a neighbour. What steps would be necessary from the point of view of hospital administration before any operative treatment could be undertaken ? (*b*) How would you dispose of a patient's clothing and valuables whilst he is in hospital ? (P. 89.) (*Final, General.*)

34. You are in charge of the casualty department when a child is brought in (*a*) who has been injured in a street accident ; (*b*) after submersion in a pond. What observations would you make of the patient, and, pending the arrival of the doctor, what would be your duty regarding the individuals who came with the child ? (Pp. 87-89, 234, 231.) (*Final, Children's.*)

35. What precautions would you take in a general ward to prevent entry or spread of infection ? (P. 89.) (*Final, Children's.*)

36. Why is it important to take an accurate history when admitting an infectious case to the hospital ? What factors would govern the procedure of bathing a patient on admission ? (Pp. 90, 88.) (*Final, Fever.*)

37. How would you prepare for an inventory of ward equipment ? (P. 91.) (*Final, General.*)

38. State approximately what stock of bed-linen, blankets, and patients' clothing would be required to equip adequately a male diphtheria ward of ten beds. What do you know about the care of linen ? (Pp. 91, 66.) (*Final, Fever.*)

CHAPTER V.

1. What is the normal respiration rate? How may it be taken? What are the points to note regarding patients' respiration? (Pp. 97, 225.) (*N. Ireland, Preliminary.*)

2. What do you mean by "taking" (*a*) temperature, (*b*) pulse, (*c*) respiration? What method would you use in each case? (Pp. 101, 93, 97.) (*Preliminary.*)

3. What do you understand by hyperpyrexia? (P. 100.) (*Final, Children's.*)

4. What is meant by the following terms: (*a*) continued fever, (*b*) remittent fever; (*c*) intermittent fever? Give examples of diseases in which these types occur. (Pp. 100-101.) (*Final, General.*)

5. Define shortly the terms crisis and lysis. (P. 101.) (*Final, General.*)

6. What is the normal temperature, pulse, and respiration? Describe the use of the clinical thermometer and the different ways of taking a patient's temperature. (Pp. 94, 97, 99, 101-103.) (*Preliminary.*)

7. What are the nurse's duties with regard to taking the patient's temperature so as to ensure that the doctor shall obtain reliable information? (Pp. 101-103.) (*Final, General.*)

8. How would you care for and cleanse clinical thermometers? (P. 103.) (*Preliminary.*)

9. What do you understand by (*a*) incontinence of urine, (*b*) retention of urine, (*c*) suppression of urine? To what may these conditions be due, and how could you, as a nurse, relieve them? (Pp. 104-105, 651, 381, 82, 288.) (*Final, Children's.*)

10. Distinguish between the terms retention and suppression of urine. Under what circumstances may these conditions arise in the course of the infectious fevers? (P. 104-105.) (*Final, Fever.*)

11. What do you mean by retention? (P. 105.) (*Preliminary.*)

12. What should a nurse observe in regard to urine, irrespective of testing? (Pp. 104-107.) (*Preliminary.*)

13. Briefly describe specific gravity. (P. 107.) (*Preliminary.*)

14. State how you would test urine for the presence of sugar, pus, bile, blood. In what diseases might you expect these to be present? (Pp. 109-111.) (*Final, Fever.*)

15. How would you test the urine for albumin, sugar, phosphates, urates, pus, and blood? (Pp. 108-111.) (*Final, General.*)

16. What do you understand by hæmaturia? What inquiries would you make of the parents, and why? (Pp. 110, 286, 330.) (*Final, Children's.*)

CHAPTER VI.

1. What would you have ready for the doctor if he were putting a child's lower limb on extension? (P. 128.) (*N. Ireland, Preliminary.*)

CHAPTER VII.

1. Enumerate the different kinds of enemata, stating briefly the use of each. (P. 133.) (*Preliminary.*)

2. For what purposes are the following given: turpentine enema, starch enema. Describe the preparation of each and method of giving. (Pp. 133-134.) (*Final, Fever.*)

3. How would you proceed to give a nasal douche during infancy? (P. 135.) (*Final, Children's.*)

4. Why are the following applications ordered for patients suffering from nose or throat troubles, and what are the methods employed for carrying out the treatment: (*a*) nasal douche; (*b*) gargle; (*c*) spray? (P. 135.) (*Final, General.*)

5. Describe exactly how you would syringe out an ear for an accumulation of wax. (P. 136.) (*Final, General.*)

6. How would you syringe an ear in a child of two years? For what is this done, and what lotions may be ordered, and at what temperature should they be used? (P. 136.) (*Final, Children's.*)

7. Explain how you would bathe and dress a case of conjunctivitis affecting the right eye? How would you instil drops into the eye. (Pp. 136, 611.) (*Final, General.*)

8. What do you understand by lavage? (P. 137.) (*Final, Children's.*)

9. How would you proceed to carry out gastric lavage during infancy? (P. 138.) (*Final, Children's.*)

10. Describe how you would prepare and give a lavage of the stomach for (*a*) adults, (*b*) infants. (Pp. 137-138.) (*Final, General.*)

11. Describe how you would prepare for vaginal douche. In what diseases may it be required? (P. 139.) (*Final, Fever.*)

12. Describe in detail the method of preparing and administering a vaginal douche. (P. 139.) (*Final, General.*)

13. Describe in detail the method of washing out the bladder. What are the dangers to the patient if carelessly done? (P. 140.) (*Scot., Final, General.*)

14. How may artificial feeding be administered to a patient? State the special points to be observed in giving the various feeds. (Pp. 141-145.) (*Final, General.*)

15. Under what conditions is nasal feeding likely to be ordered? Describe the preparation of the apparatus required, and the dangers to be guarded against in the administration of food by nasal tube. (P. 141.) (*Final, Fever.*)

16. What methods are available for feeding an unconscious patient? Indicate the special precautions in each case. (Pp. 141-145.) (*Final, General.*)

17. Why do patients who are being fed by rectum require a simple enema daily? How would you prepare and administer a nutrient enema? (Pp. 143-145.) (*Final, Fever.*)

18. Mention the usual conditions for which a nutrient enema is ordered in a fever hospital. Describe the preparation of the enema and the apparatus with which you would give it. (Pp. 143, 132.) (*Final, Fever.*)

19. How would you give a subcutaneous saline during infancy? (P. 146.) (*Final, Children's.*)

20. What methods are employed to introduce fluid into a child's body? What is the object of giving fluid, and why is salt solution used? (Pp. 145-149.) (*Final, Children's.*)

21. State in detail the method of giving a subcutaneous infusion to a patient. If improperly done, what dangerous consequences may occur? (P. 146.) (*Final, General.*)

22. What are the various methods of administering saline solution? Describe the preparation necessary for the giving of an intravenous saline injection. (Pp. 145-147.) (*Final, Fever.*)

23. How would you sterilise or render surgically clean a glass hypodermic syringe? (P. 149.) (*Final, General.*)

24. How would you administer and what area of the body would you choose, and why, in giving (*a*) simple hypodermic of atropine, (*b*) diphtheria antitoxin, (*c*) ether? (Pp. 149-151.) (*Final, Children's.*)

25. Describe how you would prepare for lumbar puncture. In what diseases may it be required? (P. 154.) (*Final, Fever.*)

26. Of what materials are catheters made? Outline the preparation for catheterisation of a female. (Pp. 155-157.) (*Final, Fever.*)

27. How would you cleanse rubber catheters after use? (Pp. 156-157.) (*Preliminary.*)

28. Give details how to sterilise as quickly as possible a gum elastic catheter. (Pp. 156, 163.) (*Final, Children's.*)

29. Describe in detail the method of passing a female catheter. (P. 156.) (*Final, General.*)

30. Describe in detail how you would proceed to obtain a catheter-specimen of urine for bacteriological examination. (P. 156.) (*Final, General.*)

31. For examination per rectum, how would you arrange the patient, and what would you get ready for the doctor? (P. 158.) (*Scot., Final, Fever.*)

32. For what reasons are test meals given? How are they given, and how are the products collected for examination? (P. 158.) (*Final, General.*)

33. In what conditions may a bismuth or barium meal be ordered? State the procedure. (P. 159.) (*Final, General.*)

34. Give details how to sterilise as quickly as possible a 10 cc. record syringe. (P. 159.) (*Final, Children's.*)

35. What is the most suitable way of cleansing glass syringes? (Pp. 160-161.) (*Preliminary.*)

36. How would you sterilise a serum syringe? (P. 160.) (*Final, Fever.*)

CHAPTER VIII.

1. For what purposes are heat and cold respectively employed in nursing? What are the different methods, local and general, in use for applying same, and how are they carried out? (Pp. 166-177, 181-190.) (*Final, General.*)

2. Describe any methods you know for reducing the temperature in childhood. (Pp. 168-171.) (*Final, Children's.*)

3. What should be the temperature of the water when giving a hot bath to (*a*) an adult, (*b*) an infant? (Pp. 172, 368.) (*Final, Fever.*)

4. How should a bed be arranged for a vapour bath? Give particulars of how this bath is given. What points should be observed while the patient is having this form of treatment? (P. 173.) (*Scot., Final, Fever.*)

5. Name four varieties of packs and the purpose for which each may be given. Describe the method of giving two of them. (Pp. 168, 176.) (*Final, Fever.*)

6. How would you prepare and administer the following: (*a*) a cold pack; (*b*) a hot-air bath? (Pp. 168, 175.) (*Final, General.*)

CHAPTER IX.

1. Mention the important precautions to observe in making, applying, and removing a linseed poultice. (P. 182.) (*Final, Fever.*)

2. Describe the preparation and mode of application of the following: (*a*) linseed poultice; (*b*) turpentine stupe: (*c*) ice-bag; (*d*) mustard leaf; (*e*) leech; (*f*) dry cup. (Pp. 182, 185, 188, 191, 192, 194.) (*Final, Children's.*)

3. What is the difference between a medical and a surgical fomentation? Give your methods of applying both. (P. 184.) (*Preliminary.*)

4. How would you prepare a simple fomentation, a turpentine stupe, an opium fomentation? (Pp. 184-186.) (*Final, General.*)

5. Describe how you would prepare and use a turpentine stupe; an evaporating lotion. (Pp. 185, 189.) (*Final, Fever.*)

6. What are a nurse's duties in the prevention of burns from hot-water bottles? (P. 186.) (*Scot., Preliminary.*)

7. What are the chief uses of ice in nursing? How would you make and apply (*a*) an ice poultice, (*b*) an ice compress? (Pp. 53, 170, 187-189, 457, 604, 613.) (*Final, Fever.*)

8. What is a counter-irritant? Name any that you know, and methods of application. (Pp. 190-194.) (*Final, Children's.*)

9. What is meant by counter-irritation? Name three counter-irritants and the method of their application. (P. 190.) (*Final, Fever.*)

10. How would you apply (*a*) a mustard leaf; (*b*) a belladonna plaster, (*c*) a blistering plaster? (Pp. 190-192, 199.) (*Final, General.*)

11. What care is necessary in the application of leeches? Give examples of conditions as to when they are applied. (P. 192.) (*Scot., Final, Children's.*)

12. How would you apply a leech? (P. 193.) (*Final, Fever.*)

13. What steps would you take to check hæmorrhage from a leech bite. (P. 193.) (*Final, General.*)

CHAPTER X.

1. Write out rules for the safe keeping and administration of medicines, giving a reason for each rule. (P. 195.) (*Final, General.*)

2. What are the rules for giving medicines ? Write out the tables of the weights and measures with the symbols used. (Pp. 195, 202.) (*N. Ireland, Preliminary.*)

3. Discuss the introduction of drugs through the skin of children. (P. 198.) (*Final, Children's.*)

4. What do you mean by *t.d.s.*, *p.r.n.*, *hac nocte ?* (P. 201.) (*Preliminary.*)

5. State in English the meaning of the following : *statim, nocte et mane, gutta, post cibos.* (P. 201.) (*Final, Fever.*)

6. Write the abbreviations and symbols for (1) thrice daily after food ; (2) as occasion requires ; (3) half a fluid ounce ; (4) a pint and a half. (Pp. 201, 202.) (*Scot., Preliminary.*)

7. Write out the table of apothecaries' fluid measure, and give symbols employed for this measure in prescriptions. State the equivalents of apothecaries' fluid measure in the metric system. (P. 202, 203.) (*Final, General.*)

8. What do you understand by the following terms : centigram ; millimetre ; litre ? What is the equivalent of a pint in cubic centimetres ? (P. 202.) (*Final, General.*)

9. A solution contains 25 grains of chloral in each fluid ounce. The doctor orders 10 grains to be given ; how much of the solution would you give ? (P. 203.) (*Final, Fever.*)

10. A patient has been ordered a hypodermic injection of $\frac{1}{10}$ grain of morphine. How would you prepare and administer this from a $\frac{1}{4}$ grain tablet ? (P. 204.) (*Final, Fever.*)

11. For what purposes are the following classes of drugs administered : (*a*) sedatives ; (*b*) antipyretics ; (*c*) cardiac drugs ? Give one example of each ; describe its effect and the symptoms of an overdose. (Pp. 206, 210.) (*Final, General.*)

12. State briefly the average adult dose of the following drugs, and state how you would administer them : liq. strych. ; compound tincture of benzoin ; morphine suppository ; croton oil. (Pp. 208, 197, 209, 205.) (*Final, General.*)

13. What signs and symptoms may occur in children taking, and who are specially susceptible to, digitalis, atropine, opium, strychnine, arsenic, mercury ? Are any of these drugs specially dangerous when given to young children ? (Pp. 210-212.) (*Final, Children's.*)

14. What would you do in morphia poisoning pending the arrival of a doctor ? (Pp. 213-214.) (*Final, Fever.*)

15. What would you do pending the arrival of the house surgeon in a case of attempted suicide by swallowing carbolic acid solution ? (Pp. 213, 216.) (*Final, General.*)

16. What would you do for a patient accidentally poisoned by swallowing carbolic lotion 1 in 20, if medical aid could not be obtained ? (Pp. 213, 216.) (*Final, General.*)

17. Give one example of a drug belonging to each of the following classes, stating the effects of the drug and the symptoms of overdose: (*a*) anæsthetic, (*b*) narcotic, (*c*) specific. (Pp. 207, 211, 461, 518.) (*Final, General.*)

18. Give some examples of irritant poisons. State what you know of poisoning by carbolic acid and its after-treatment. (P. 216.) (*Final, Fever.*)

19. Describe the symptoms and general treatment of irritant poisoning, and mention the commoner irritant poisons. (P. 216.) (*Scot., Final, General.*)

20. In what different ways is mercury used in medicine and surgery? Give one example in each case. What are the symptoms of mercurial poisoning? (Pp. 151, 199, 461, 510, 211, 217.) (*Final, General.*)

21. In a case of suspected criminal poisoning, what are the duties which would devolve upon a nurse as to (*a*) attendance on the patient: (*b*) attitude towards relatives and friends? (P. 218.) (*Final, General.*)

CHAPTER XI.

1. Mention the points which a nurse should notice and report regarding a patient's pain, skin, sleep, and excreta. (Pp. 221, 222, 227, 225, 271, 104.) (*Scot., Preliminary.*)

2. Mention the points to be observed by a nurse regarding a patient's vomiting, cough, and sleep. (Pp. 224, 269, 226, 227.) (*Scot., Preliminary.*)

3. What special observations can be made with the naked eye in an examination of sputum? Mention characteristic appearances associated with some special diseases. (P. 226.) (*Final, General.*)

CHAPTER XII.

1. What is epistaxis? What inquiries would you make of the parents, and why? (P. 229.) (*Final, Children's.*)

2. In a case of vomiting of blood, what steps would you take before the arrival of medical assistance? (P. 229.) (*Final, General.*)

3. What would you do in infantile convulsions and severe epistaxis pending the arrival of a doctor? (Pp. 229, 230.) (*Final, Fever.*)

4. How and where may a child injure himself by the introduction of a foreign body? What symptoms may arise? Give examples from your own experience. What steps would you take to prevent an accident of this kind happening to a child in your care? (Pp. 233-234.) (*Final, Children's.*)

5. A child is admitted to hospital following a fall on to the head. By what signs would you suspect serious injury? How would you handle such a case? (Pp. 235, 577.)
(*Final, Children's.*)

CHAPTER XIII.

1. What are bacteria? Name and describe the chief groups into which they are classified according to shape. In what way are they reproduced? (Pp. 237-240.)
(*Final, Fever.*)

2. What do you understand by "pathogenic"? (P. 237.)
(*Final, Fever.*)

3. What do you mean by putrefaction? (P. 237.)
(*Preliminary.*)

4. What are the commoner organisms concerned in the suppuration of wounds? What conditions especially favour their growth? State in detail how specimens of pus are taken for examination. (Pp. 239, 162.)
(*Scot., Final, Children's.*)

CHAPTER XIV.

1. What do you understand by immunity in disease? Distinguish between natural, acquired, and artificial immunity. (Pp. 242, 245, 246.) (*Final, Fever.*)

2. What is serum treatment? Describe how diphtheria antitoxin is prepared, its dosage, and modes of administration. (Pp. 244, 151.) (*Final, Fever.*)

3. Describe the various serum rashes, and name the diseases for which they may be mistaken. What symptoms may accompany a serum rash? (P. 244.) (*Final, Fever.*)

4. State what you know of serum rashes. (P. 244.)
(*Final, Fever.*)

5. What are the principles underlying the use of antitoxins and vaccines in infectious diseases? Give an example of each, and state the nurse's duties in connection with the carrying out of such treatment. (Pp. 244, 247, 248, 151.)
(*Final, General.*)

6. What do you understand by passive immunisation ? (P. 246.) (*Final, Fever.*)

7. How is vaccine lymph prepared ? (P. 247.) (*Final, Fever.*)

CHAPTER XV.

1. Describe the symptoms produced by pericarditis. What treatment is usually adopted ? What are the most common causes ? (P. 249.) (*Final, General.*)

2. Describe the nursing care and feeding of a child aged eight years with acute rheumatic pericarditis. (Pp. 250, 61.) (*Final, Children's.*)

3. Describe the appearance and enumerate the discomforts of a patient suffering from advanced mitral disease. What means would you take to relieve his distress ? (Pp. 251-255.) (*Final, General.*)

4. What do you understand by cyanosis ? (P. 252.) (*Final, Children's.*)

5. What do you understand by cyanosis ? Under what conditions is it likely to occur ? (Pp. 252, 86, 260-262, 377, 408.) (*Final, Children's.*)

6. What do you mean by œdema, anæmia, dyspnœa, and cyanosis ? Give one or two examples of diseases in which each of these conditions occurs. (Pp. 252, 287, 257, 97.) (*Final, General.*)

7. How would you nurse a case of valvular disease of the heart, showing signs of failing power ? (P. 253-255.) (*Final, General.*)

8. Describe the chief difficulties in nursing a case of heart disease complicated by severe œdema. How might this complication be treated ? (Pp. 253-255.) (*Final, General.*)

9. What do you understand by œdema ? Enumerate the several conditions in which it may be found. State how you would nurse the various kinds. (Pp. 252, 287.) (*Final, General.*)

10. What do you know about the causation of heart disease of childhood ? Describe three symptoms or signs of heart disease that you as a nurse would notice. (Pp. 326, 377, 250-252.) (*Final, Children's.*).

CHAPTER XVI.

1. What do you understand by the term tracheitis ? (P. 259.) (*Final, Children's.*)

2. What is meant by the terms bronchitis and secretion ? (P. 260.) (*Final, Children's.*)

3. In a case of acute bronchitis in a child, describe the treatment you would adopt and directions that you would give. (P. 260.) (*Final, General.*)

4. An old obese man has very severe acute bronchitis. What are the chief dangers, and how would you nurse the case? (Pp. 260, 267.) (*Final, General.*)

5. What are the special points to be observed in the nursing of an elderly patient suffering from chronic bronchitis? Give an account of a case that has come under your notice. (Pp. 260, 267.) (*Final, General.*)

6. Describe the nursing and feeding of a small child suffering from broncho-pneumonia. (P. 261.) (*Final, Children's.*)

7. What are the forms of pneumonia occurring during childhood? Describe a severe case of pneumonia in a child of six months old, and give the nursing and feeding of such a case. (Pp. 261-264.) (*Final, Children's.*)

8. Discuss the nursing and care of a child with pneumonia in a private house. Specially discuss the room, giving a sketch plan of the position of the cot, and emphasise the chief points in the diet. (Pp. 261-264.) (*Final, Children's.*)

9. Describe the clinical characteristics, course, and complications of a case of lobar pneumonia in an adult. (P. 262.) (*Final, General.*)

10. Give a short account of the causation, symptoms, course, and complications of a case of lobar pneumonia. (P. 262.) (*Final, General.*)

11. What are the most important points you would refer to in a full report on sputum in pneumonia? (P. 262.) (*Final, Fever.*)

12. Write a report on what you imagine might have been your nursing care of a case of lobar pneumonia from 8 A.M. to 8 P.M. on the fifth day of the disease; your report to be such as you would give to the nurse taking charge of the patient for the night. (P. 262.) (*Final, General.*)

13. What is meant by "pleurisy"? What are its different forms? Give the symptoms of each. (P. 264.) (*Final, General.*)

14. What do you understand by empyema? (P. 264.) (*Final, Children's.*)

15. What do you know about the causes of empyema? Describe the treatment and nursing of any case of empyema you have nursed. (Pp. 264, 544-545.) (*Final, Children's.*)

16. What is hypostatic pneumonia? In what type of case is it most likely to occur, and what steps can be taken by a nurse to assist in its prevention? (P. 267.) (*Findl, Fever.*)

CHAPTER XVII.

1. Enumerate the causes of vomiting. Of what may vomit consist? What special methods of treatment may be required? (Pp. 269, 531.) (*Final, General.*)

2. What special observations can be made with the naked eye in an examination of vomit? Mention characteristic appearances associated with some special diseases. (P. 269.) (*Final, General.*)

3. How would you distinguish hæmoptysis from a hæmorrhage from the stomach? (P. 269.) (*Final, General.*)

4. What is (*a*) hæmatemesis; (*b*) hæmoptysis? What inquiries would you make of the parents, and why? (Pp. 269, 466.) (*Final, Children's.*)

5. What care should a patient receive when vomiting? What special observations should a nurse make when a patient vomits blood? (P. 531, 269.) (*Final, Fever.*)

6. What should a nurse observe in regard to stools? (P. 271.) (*Preliminary.*)

7. What do you mean by tenesmus? (P. 272.) (*Preliminary.*)

8. What do you understand by constipation? Indicate natural means of overcoming this condition, with special reference to diet, giving reasons for your statements. (P. 272.) (*Final, General.*)

9. What are the chief causes of jaundice? A patient under your care looks as if he may be jaundiced. What investigations would you make as a nurse to decide whether jaundice was present? (Pp. 274, 111.) (*Final, Children's.*)

10. What do you understand by the term stomatitis? (P. 274.) (*Final, Children's.*)

11. What are the common affections of the mouth in young children, and how would you nurse them? (P. 274.) (*Final, General.*)

12. What are the symptoms of gastric ulcer? From what other abdominal conditions has it to be diagnosed? Give the points of distinction. (Pp. 276, 158.) (*Final, General.*)

13. Outline a dietary for a patient suffering from gastric ulcer with slight hæmatemesis. (P. 277.) (*Scot., Final, General.*)

14. Describe the nursing of a patient suffering from gastric ulcer with hæmatemesis. (P. 277.) (*Final, General.*)

15. What are the symptoms and signs of acute intestinal obstruction in a child? Mention the common causes of this condition. (Pp. 280, 374.) (*Final, Children's.*)

16. Discuss the nursing of a case of general peritonitis. (P. 284.) (*Final, Children's.*)

17. Describe the nursing, care, and feeding of a case of tubercular peritonitis. What are the common signs and symptoms of this disease ? (P. 284.) (*Final, Children's.*)

18. Describe the symptoms and signs of tuberculous peritonitis. What are the complications ? What preventive measures can be taken against the disease ? (Pp. 284, 444.) (*Final, General.*)

CHAPTER XVIII.

1. Describe the symptoms and course of acute nephritis in an adult. What are the most common causes ? (P. 286.) (*Final, General.*)

2. What are the most important points to which you would refer in a full report on urine in scarlatinal nephritis ? (Pp. 104-110, 286-288.) (*Final, Fever.*)

3. Describe a case of acute nephritis. How would you nurse such a case ? Mention diet and nursing treatment that might be ordered. (P. 286.) (*Final, Children's.*)

4. Describe the nursing of a case of acute nephritis in a child. (P. 286.) (*Final, Children's.*)

5. What do you understand by œdema ? Enumerate the several conditions in which it may be found. State how you would nurse the various kinds. (Pp. 252, 287.) (*Final, General.*)

6. When nursing a patient suffering from nephritis what symptoms would lead you to suspect that a uræmic attack was imminent ? What appliances would you have ready for use ? (Pp. 288, 173.) (*Final, Fever.*)

7. What do you understand by the term bacilluria ? (P. 291.) (*Final, Children's.*)

8. What are the following, and in what conditions are they found : papules, macules, vesicles, bullæ, pustules, scabs ? (P. 292.) (*Final, General.*)

9. What do you mean by the term erythema ? (P. 291.) (*Final, Children's.*)

10. What are the chief functions of the skin ? What do you understand by purpura, cyanosis, seborrhœa, scabies ? (Pp. 252, 292, 298.) (*Final, Children's.*)

11. Discuss the care and nursing of a small child suffering from an extensive dermatitis of the face and body. (Pp. 294-295.) (*Final, Children's.*)

12. What dietetic and local measures might be recommended for an adult patient with severe eczema? (Pp. 60, 295.) (*Final, General.*)

13. Give a short account of the main features and nursing of the following: ringworm, scabies. (Pp. 296-299.) (*Final, General.*)

14. A child develops ringworm in a ward. How would you prevent the condition spreading (*a*) on the same child; (*b*) to other children? (P. 297.) (*Preliminary.*)

15. A case with scabies has been admitted into a general ward; how would you treat the patient and the clothing? (P. 299.) (*Final, General.*)

CHAPTER XIX.

1. A patient has a convulsive seizure. What precautions would you take? Indicate points to be observed and reported on. Name three common causes of convulsive seizures. (Pp. 301, 230.) (*Scot., Final, General.*)

2. Give an account of what is known as "coma." In what diseases are you likely to meet this condition, and give its significance. (P. 304.) (*Final, General.*)

3. What do you understand by syncope? (Pp. 304, 489.) (*Final, Fever.*)

4. What are the causes of meningitis? Describe any case of meningitis you have nursed. (P. 305.) (*Final, Children's.*)

5. Describe the appearance and nursing care of a patient suffering from tubercular meningitis. (P. 305.) (*Final, General.*)

6. Describe a case of meningitis. Give the nursing and the feeding of a child a year old with this condition. (P. 305.) (*Final, Children's.*)

7. What is meant by apoplexy? How is it caused? Describe the symptoms, signs, and sequelæ. (P. 307.) (*Final, General.*)

8. What are the special points a nurse requires to attend to in nursing a patient with a severe apoplectic shock? (P. 308.) (*Scot., Final, General.*)

9. What do you understand by hydrocephalus? (P. 310.) (*Final, Children's.*)

10. State what you know of the dangers, complications, and treatment of *acute* infantile paralysis, and say what can be done to prevent it spreading. (Pp. 310-312.) (*Final, General.*)

11. How would you nurse a case of acute anterior poliomyelitis ? What complications might ensue ? (P. 310.) (*Final, General.*)

12. A child is admitted to your ward with a history of having "lost the use of his legs." What information would you obtain from the parents, and by your observations, for the use of the doctor ? What are the common causes of this condition ? (Pp. 310, 329.) (*Final, Children's.*)

13. State briefly how you would nurse a patient suffering from paralysis with incontinence. (Pp. 312, 303-304.) (*Preliminary.*)

14. How would you nurse a case of paraplegia ? What are the special points you would pay attention to ? (P. 312.) (*Final, Children's.*)

15. What is meant by an "epileptic fit" ? How is the disease recognised ? What immediate measures would you take ? (P. 315.) (*Final, General.*)

16. What do you know about the causes of convulsions during infancy and childhood ? What would you do for a child convulsed ? (P. 316.) (*Final, Children's.*)

17. What is chorea ? Describe the symptoms. What is the usual treatment ? (P. 317.) (*Final, General.*)

18. Give the diet sheet of a patient with chorea. (P. 318.) (*Scot., Final, Children's.*)

19. Give the nursing and feeding of a case of chorea. (P. 318.) (*Final, Children's.*)

20. What special points require attention in the nursing of a case of chorea ? (P. 318.) (*Scot., Final, Children's.*)

21. State in detail the steps a nurse may take in order to ensure sleep for her patients. (Pp. 87, 323.) (*Final, General.*)

CHAPTER XX.

1. Give the symptoms and signs of rheumatic fever, pointing out the difference in childhood and adults. (Pp. 325-326.) (*Final, General.*)

2. How would you nurse a case of acute rheumatism following scarlet fever ? What other complications of scarlet fever are frequently associated with this condition ? (Pp. 326, 404.) (*Final, Fever.*)

3. What are the symptoms of rheumatism as seen in childhood ? State any dangers immediate or remote in connection with this disease. (P. 326.) (*Final, Children's.*)

4. What do you understand by the term "growing pains" ? (P. 325.) (*Final, Children's.*)

5. What are the forms of rheumatism occurring in children ? Mention the chief complications of this disease. (P. 326.)
(*Final, Children's.*)

6. Give an account of the symptoms, course, and management of a case of rheumatic fever (P. 325.) (*Final, General.*)

7. What do you mean by the term vitamin ? (P. 328.)
(*Final, Children's.*)

8. Indicate the diet for a child of 1 year with scurvy, and a child of 1½ years with rickets. (Pp. 61, 330, 349.)
(*Final, General.*)

9. What do you know about the causes of rickets ? Give in detail the orders as to diet which would be given to a woman of the hospital class for her child suffering from rickets. (P. 329.)
(*Final, Children's.*)

10. State what you know about the causation of rickets. What directions would you give a mother of the hospital class in the case of her child suffering with acute rickets aged eighteen months ? (Drugs and feeding not asked for.) (P. 329.)
(*Final, Children's.*)

11. What is meant by the term hypotonia ? (P. 330.)
(*Final, Children's.*)

12. What are the special nursing points to remember in rickets and exophthalmic goitre ? (Pp. 330, 332.)
(*Final, General.*)

13. Give the chief signs and symptoms of a case of exophthalmic goitre. For what complications would you specially keep watch ? (P. 332.) (*Final, General.*)

14. What is meant by goitre ? (P. 332.)
(*Final, Children's.*)

15. Write a short account of the causation, symptoms, course, and complications of a case of diabetes. (Pp. 334-335.)
(*Final, General.*)

16. What symptoms are associated with diabetes mellitus ? How is the condition treated ? Name any complications which may occur in the course of the disease. (Pp. 335-340.)
(*Scot., Final, General.*)

17. In a case of diabetes mellitus, what general and dietetic directions would be given to the patient ? (Pp. 336-340, 61.)
(*Final, General.*)

18. Describe the nursing of a case of diabetes mellitus. Give a short account of the doctor's instructions which you were required to carry out in any case of this nature that has come under your observation. (Pp. 336-340.) (*Final, General.*)

19. How would you administer and what area of the body would you choose, and why, in giving insulin ? (P. 338.)
(*Final, Children's.*)

CHAPTER XXI.

1. What symptoms would lead you to suspect mental deficiency in a growing infant? (Pp. 342-343, 379.)
(*Scot., Final, Children's.*)

2. By what signs and symptoms would you judge that a breast-fed infant was being underfed? State exactly what you would do in such a case. (Pp. 346-348.)
(*Final, Children's.*)

3. Write what you know about the causes of failure in the continuation of breast feeding in a case where the mother has been able to feed during the first few weeks. How can such causes of breakdown be avoided? (P. 347.)
(*Final, Children's.*)

4. Describe in detail the process of weaning a baby from the breast. What diet would you give a perfectly healthy infant between the ages of ten months and two years? (Pp. 348-349.) (*Final, Children's.*)

5. Discuss the value of the following articles of diet for a healthy infant aged fifteen months: banana, stewed meat, beef-tea, rice, cauliflower, fresh herring, raw apple, bread and milk. (Pp. 348, 38-41.) (*Final, Children's.*)

6. What food do you consider ideal for an infant? Give your reasons for your choice. (Pp. 345, 350.)
(*Preliminary.*)

7. Give the composition of milk. In what way does cow's milk differ from human milk? (P. 350.) (*Preliminary.*)

8. How would you care for and cleanse babies' bottles and bottle teats? (P. 353.) (*Preliminary.*)

9. A healthy infant aged two months has to be artificially fed. Describe in detail how you would proceed, and with what difficulties you may have to contend. (Pp. 352-356, 361-364.) (*Final, Children's.*)

10. A breast-fed infant has to be weaned at three months old. It is decided to feed with a "humanised" fresh-milk mixture. Describe making of such a food, and state how you would be guided as to the quantity of the mixture to give. (Pp. 354-356.) (*Final, Children's.*)

11. Taking it that a normal child requires approximately fifty calories per pound of body weight, criticise the diet of a three-months-old infant weighing 10 lb., which consists of eight feeds in the twenty-four hours, each feed being made up with eight tablespoonfuls of milk, four of water, and one rounded teaspoonful of cane sugar. (P. 356.)
(*Final, Children's.*)

12. How may milk be modified in order to render it more digestible ? (Pp. 352, 356, 47.) (*Final, General.*)

13. Criticise the following diets for *healthy* babies : (*a*) Nestle's milk ; (*b*) cream and whey ; (*c*) Allenbury's food ; (*d*) fresh milk from one cow ; (*e*) peptonised milk. (Pp. 357, 359-361, 52, 352.) (*Final, Children's.*)

14. What are the chief differences between (*a*) human milk, (*b*) cow's milk, and (*c*) sweetened condensed milk ? In the use of sweetened condensed milk, what precautions should be taken to make the food as safe as possible for infant feeding ? (Pp. 350, 357-358.) (*Final, Children's.*)

15. A three-weeks-old baby is receiving eight feeds during the twenty-four hours, each feed consisting of three tablespoons of milk and three of water, with one teaspoon of "dairy" cream and one level teaspoon of sugar. There has been vomiting, and during the past day or two the vomiting has been severe. Discuss the possible causes of this, and state what you as a nurse would do. (Pp. 352, 354-356, 372.) (*Final, Children's.*)

16. What results may follow if a baby is fed on excess of (*a*) carbohydrate, (*b*) fat ? (Pp. 362-364, 352.) (*Final, General.*)

17. What are the chief causes of vomiting during infancy ? A baby aged two months and weighing 7 lb. is given seven feeds in twenty-four hours. Each feed consists of three level teaspoons of a dried milk and half a level teaspoon of sugar in six tablespoons of water. State your opinion whether the baby is being underfed. (Pp. 372, 355-356.) (*Final, Children's.*)

18. Describe the artificial feeding and care of a premature infant aged three weeks and weighing 4 lb. (Pp. 365-366.) (*Final, Children's.*)

19. Give in detail the care and feeding of a fortnight old infant weighing 4 lb. The baby is six weeks premature. (Pp. 365-366.) (*Final, Children's.*)

20. What shall be the temperature of the water when giving a hot bath to an infant ? Give a detailed description of the bathing and dressing of an infant. (P. 368.) (*Final, Fever.*)

21. What methods would you use to keep a sick baby (*a*) warm, (*b*) clean, (*c*) comfortable ? (Pp. 368-369.) (*Preliminary.*)

22. Give in detail your method of giving a sick baby its morning bath. (P. 368.) (*Preliminary.*)

23. Indicate the diet for an infant of six months with diarrhœa. (Pp. 371, 355.) (*Final, General.*)

24. Describe the nursing of a severe case of summer diarrhœa occurring during infancy. Describe the management and nursing of such a case. (P. 371.) (*Final, Children's.*)

25. Give in detail the nursing points to be observed in the case of an infant suffering from epidemic gastro-enteritis. (P. 371.) (*Final, Children's.*)

26. What do you know about the causation of toxic diarrhœa occurring during infancy? Describe the management and nursing of such a case. (P. 371.) (*Final, Children's.*)

27. In a case of severe summer diarrhœa in a child of four describe the nursing and treatment. What precautions would you take for other children in the house? (P. 371.) (*Final, General.*)

28. What signs and symptoms would leave you to believe that something serious had happened in a small child who has complained of acute abdominal pain? (Pp. 367-368, 279, 280, 374.) (*Final, Children's.*)

29. What do you understand by intussusception? Give the early symptoms of this condition. (P. 374.) (*Final, Children's.*)

30. What is an intussusception? Describe a typical case, and indicate the treatment. (P. 374.) (*Final, General.*)

31. Describe a typical case of intussusception. Mention the common causes, and indicate the type of patient in whom the condition usually occurs. (Pp. 374, 280.) (*Final, General.*)

32. What is a rectal prolapse? What immediate measures would you adopt when such an incident arose in a patient under your care, and what measures have you taken to prevent a recurrence? (P. 375.) (*Final, Children's.*)

33. What may be the causes of stridor coming on rather quickly in a child of five years old? If such a case was admitted to your ward, what information would you obtain from the parents, and what would you have ready for the doctor's visit? (Pp. 377, 408.) (*Final, Children's.*)

34. What is meant by the terms spina bifida and ectopia vesicæ? (Pp. 380, 381.) (*Final, Children's.*)

35. What do you understand by thyroglossal cyst? (P. 380.) (*Final, Children's.*)

36. What is meant by ectopia vesicæ? (P. 381.) (*Final, General.*)

37. You have the charge of a nervous child suffering from nocturnal enuresis. Describe in detail the management of such a case. (P. 381.) (*Final, Children's.*)

38. What do you understand by the term diurnal enuresis? (P. 381.) (*Final, Children's.*)

39. Why do glands in the neck become enlarged in children? What complications have you seen arise in this condition? (Pp. 381-382.) (*Final, Children's.*)

40. What are the common causes of enlargement of the lymphatic glands of the neck? What complications may follow the enlargement? State what you know about the treatment of the enlargement and the complications, specially with regard to the nursing measures you might be called upon to carry out. (Pp. 381-382.) (*Final, Children's.*)

41. Discuss the causation and prevention of dental caries. (P. 382.) (*Final, Children's.*)

42. How would you feed a child after extensive extraction of teeth? (P. 383.) (*Final, Children's.*)

43. Discuss the reasons why a baby's buttocks become sore. How do you (*a*) prevent and (*b*) deal with the condition? (P. 383.) (*Final, Children's.*)

44. What do you understand by a nævus? (P. 383.) (*Final, Children's.*)

45. What do you understand by a nævus? What forms of treatment are you acquainted with, and what complications may arise? (P. 383.) (*Final, Children's.*)

46. To what points would you especially pay attention in the case of a small infant under treatment with a truss for hernia? Operative treatment is not advised. (P. 384.) (*Final, Children's.*)

CHAPTER XXII.

1. What do you understand by infective virus? Describe the various modes by which infection may be conveyed from one individual to another. (Pp. 387-390.) (*Final, Fever.*)

2. Describe the various means by which disease germs may be carried from the sick to the healthy. Illustrate your answer by examples. (Pp. 387-390.) (*Final, Fever.*)

3. From what parts of the body may contagious or infectious discharges arise? What precautions would you take in dealing with such patients in a children's ward? (Pp. 387-388, 89-90.) (*Final, Children's.*)

4. By what channels may the bacteria of tuberculosis, scarlet fever, and typhoid fever be given off from the body? (P. 388.) (*Final, Fever.*)

5. What precautions should a nurse take to protect herself when nursing an infectious disease? How may blankets and woollens be disinfected without damage? (Pp. 388, 397.) (*Final, Fever.*)

6. What do you understand by rigor ? (P. 392.) (*Final, Fever.*)

7. What do you mean by the incubation period of infectious diseases ? (P. 392.) (*Preliminary.*)

8. Define shortly the terms incubation period, rash, and quarantine. (Pp. 392, 394.) (*Final, General.*)

9. What do you understand by prodromal period ? (P. 392.) (*Final, Fever.*)

10. What do you understand by prophylaxis ? (P. 393.) (*Final, Fever.*)

11. What do you understand by the term quarantine ? (P. 394.) (*Preliminary.*)

12. What do you understand by the following : quarantine ; segregation ; barrier nursing ; bed isolation ? (Pp. 394-396.) (*Final, Fever.*)

13. How would you (*a*) prepare a room for an infectious patient in a private house, and (*b*) prepare the room for disinfection afterwards ? (Pp. 394, 400.) (*Preliminary.*)

14. You are sent to nurse a case of infectious disease in a private house. Describe how you would furnish a sick room, and the measures you would take to protect other members of the household from contracting the infection. (P. 394.) (*Final, Fever.*)

15. What steps would you take to prevent cross infection in a fever hospital ? (Pp. 395-396.) (*Final, Fever.*)

16. What do you understand by the term disinfection ? (P. 396.) (*Preliminary.*)

17. Describe the methods whereby bacteria may be killed. (P. 397.) (*Final, Children's.*)

18. How is soiled linen from an enteric patient dealt with in hospital ? (P. 398.) (*Final, General.*)

19. How would you deal with the various articles of clothing of a patient admitted in an infectious and verminous condition ? (Pp. 77, 397-398.) (*Preliminary.*)

20. How is the infection of scarlet fever transmitted ? How would you prevent the spread of this infection when nursing in a town house ? (Pp. 388, 394, 397-401.) (*Preliminary.*)

21. What steps would you take to prevent the spread of infection in a private house in which a case of scarlet fever has occurred ? (Pp. 394, 397-401.) (*Final, Children's.*)

22. A patient develops scarlet fever in a hospital ward. What would be your duty after the removal of the patient to isolation in regard to the various articles which have been used ? (Pp. 398, 400.) (*Preliminary.*)

23. How would you disinfect a room after the nursing of a patient with an infectious disease ? (P. 400.)
(*N. Ireland, Preliminary.*)

24. Describe how you would disinfect the stools, urine, sputum, and linen of an infectious case in a private house. How would you disinfect the patient and yourself at the termination of the case ? (Pp. 394, 398-401.)
(*Final, Fever.*)

25. In what ways may water be employed as a therapeutic agent in infectious diseases ? (Pp. 401-402.)
(*Final, Fever.*)

26. What food do you consider ideal for a patient suffering from an acute fever ? Give your reasons for your choice. (P. 402.) (*Preliminary.*)

27. In what ways can a nurse vary a milk diet in order to make it more appetising ? (P. 402.) (*Final, General.*)

28. Explain what is meant by (*a*) infectious disease and (*b*) contagious disease. What are the characteristics of an acute infectious disease ? (Pp. 402, 392.) (*Final, Children's.*)

CHAPTER XXIII.

1. What are the earliest signs and symptoms of scarlet fever ? How soon after exposure to infection would you expect the onset ? (P. 403.) (*Final, Fever.*)

2. Describe the symptoms which usually precede the characteristic eruption of scarlatina. (P. 403.)
(*Final, Fever.*)

3. By what channel may the middle ear become infected in the course of scarlet fever ? What symptoms, if present, in a patient with otorrhœa should you report at once, and why ? (Pp. 404, 610.) (*Final, Fever.*)

4. State what you know of otorrhœa. (Pp. 404, 610.)
(*Final, Fever.*)

5. Describe the signs and symptoms of a case of septic scarlet fever. What complications are liable to occur, and how would you nurse them ? (Pp. 403-406.)
(*Final, Fever.*)

6. About when does nephritis arise in scarlet fever ? How would you nurse a case ? (Pp. 404, 287.)
(*Final, Fever.*)

7. What septic complications may arise in a scarlet fever ward ? Describe the measures usually taken to prevent their spread from patient to patient. (Pp. 403-406.)
(*Final, Fever.*)

8. Give a short account of the main features and nursing of scarlet fever. (Pp. 403-406.) (*Final, General.*)

9. Give a short description of the Schultz-Charlton test. (P. 405.) (*Final, Fever.*)

10. For what purpose are Schick's and Dick's tests made? Describe the Schick test in detail. (Pp. 405, 407.) (*Final, Fever.*)

11. Give the incubation periods of scarlet fever and diphtheria. (Pp. 403, 407.) (*Final, Fever.*)

12. What is the cause of diphtheria? Mention the usual methods of infection, and describe the symptoms and signs. (Pp. 407-409, 388-389.) (*Final, General.*)

13. What are toxins? Where are these produced in the case of diphtheria; also what complications may result from their presence? (Pp. 240, 407, 409.) (*Final, Fever.*)

14. Give a short account of the onset, course, and nursing of laryngeal diphtheria. (Pp. 408, 412-419.) (*Final, Fever.*)

15. What regions of the body are most commonly affected with paralysis following diphtheria? What early indications of this complication would you watch for and report? (P. 409.) (*Final, Fever.*)

16. At what period of the disease is albuminuria liable to occur in scarlet fever and in diphtheria? What significance is to be attached to its presence in each of these diseases, and how would you nurse the condition? (Pp. 404, 409, 287.) (*Final, Fever.*)

17. Describe a case of post-diphtheritic paralysis. Give the nursing and feeding of a severe case. (Pp. 409, 412.) (*Final, Children's.*)

18. State what you know of paralysis in diphtheria. (Pp. 409-412.) (*Final, Fever.*)

19. Write a full account of the nursing of a patient suffering from diphtheria. (Pp. 410-412.) (*Final, General.*)

20. Give a short description of palatal paralysis in diphtheria. (P. 409.) (*Final, Fever.*)

21. Describe the symptoms of a case of laryngeal diphtheria, and the nursing of such a case before operation. What changes in the patient's condition would lead you to send for the doctor? (Pp. 408, 412.) (*Final, Fever.*)

22. Describe in detail the preparation to be made for the operation of tracheotomy. (Pp. 605, 412.) (*Final, Fever.*)

23. Describe in detail the nursing of a child after tracheotomy. (Pp. 412-417.) (*Final, Children's.*)

24. What are the important complications that may occur after an operation for laryngeal diphtheria ? (P. 414.)
(*Final, Children's.*)

25. How would you feed a child after (*a*) tracheotomy, (*b*) intubation. (Pp. 417, 419.) (*Final, Fever.*)

26. What do you understand by intubation ? (P. 417.)
(*Final, Fever.*)

27. What do you understand by a "return case" ? Name the diseases in which return cases are met with, and describe the precautions a nurse should take to prevent their occurrence. (P. 419.) (*Final, Fever.*)

CHAPTER XXIV.

1. What do you understand by paratyphoid ? (P. 420.)
(*Final, Fever.*)

2. Give the incubation period of enteric fever. (P. 420.)
(*Final, Fever.*)

3. Describe the early symptoms of a case of typhoid ? What are the complications liable to occur in the disease, and how would you recognise them ? (Pp. 420-422.)
(*Final, General.*)

4. Describe the rash of typhoid fever. At what stage is it first seen ? (P. 421.) (*Final, Fever.*)

5. What are the most important points to which you would refer in a full report on stools in typhoid fever ? (Pp. 421, 271.)
(*Final, Fever.*)

6. For what purpose is the Widal test made ? (Pp. 421, 243.) (*Final, Fever.*)

7. What precautions would you take to prevent the spread of infection when nursing a case of enteric fever: (*a*) to yourself ; (*b*) to others ? (Pp. 388, 423.)
(*Preliminary.*)

8. By what channels may the bacteria of typhoid fever be given off from the body ? (Pp. 388, 398-399, 423.)
(*Final, Fever.*)

9. Describe the nursing of a case of enteric fever. (Pp. 422-428.) (*Final, General.*)

10. What are the chief points to pay attention to when nursing a case of enteric fever ? Enumerate the chief complications, and state the period in the illness when they are likely to arise. (Pp. 421-428.) (*Final, Fever.*)

11. What do you understand by (*a*) relapse ; (*b*) post-typhoid pyrexia ? (P. 421.) (*Final, Fever.*)

12. Describe in detail the nursing of a patient with typhoid fever. What symptoms would you look for in connection with any complications that might arise ? (Pp. 422-428.)
(*Final, Children's.*)

13. Why is bed bathing so necessary in the nursing of enteric fever ? (P. 423.) (*Final, Fever.*)

14. What complications may occur in the course of enteric fever ? What early indications of these would you watch for and report ? (P. 421.) (*Final, Fever.*)

CHAPTER XXV.

1. Describe the symptoms which usually precede the characteristic eruption of smallpox. (P. 429.)
(*Final, Fever.*)

2. Give a short description of smallpox. State the main differences between the eruption of smallpox and chickenpox. (Pp. 429-434.) (*Final, Fever.*)

3. Describe the onset and eruption of smallpox. What complications are liable to occur, and how would you nurse them ? (Pp. 429-432.) (*Final, Fever.*)

4. Describe the preparation of the skin for vaccination and its subsequent dressing. What complications are to be guarded against ? (P. 432.) (*Final, Fever.*)

5. Describe the symptoms and course of vaccinia. What local complications may arise ? (P. 432.) (*Final, Fever.*)

6. Describe the rash of chickenpox. At what stage is it first seen ? (P. 433.) (*Final, Fever.*)

7. Describe the appearance and symptoms of a case of chickenpox. In a private house what steps would you take to prevent the disease spreading ? (Pp. 433, 394.)
(*Final, General.*)

8. Describe the onset and course of a severe case of measles. What are the most common complications of this disease, and how would you nurse them ? (P. 435.) (*Final, Fever.*)

9. Describe the symptoms which usually precede the characteristic eruption of measles. Give a short description of Koplik's spots. (P. 435.) (*Final, Fever.*)

10. State what you know of Koplik's spots. (P. 435.)
(*Final, Fever.*)

11. What are the special nursing points to remember in measles ? (P. 436.) (*Final, General.*)

12. Describe the nursing of a child with measles in a private house. (Pp. 394, 436.) (*Final, Children's.*)

13. What are the symptoms of measles in children? What complications are most common, and how would you try to prevent them? (P. 435.) (*Final, General.*)

14. A ward has been quarantined for measles. How soon would you expect a case? What are the signs and symptoms you would look for? (P. 435.) (*Final, Fever.*)

15. Describe the onset, signs, and symptoms of rubella. For what other diseases is this disease likely to be mistaken? How would you distinguish it from them? (P. 437.) (*Final, Fever.*)

16. Give the incubation periods of smallpox, chickenpox, measles, rubella, and whooping-cough. (Pp. 429, 433, 435, 437, 439.) (*Final, Fever.*)

17. In what part of the body does the infection lie in a case of epidemic cerebro-spinal meningitis? Give a short description of the onset and course of the disease. (P. 437.) (*Final, Fever.*)

18. By what channels may the bacteria of cerebro-spinal fever be given off from the body? (P. 438.) (*Final, Fever.*)

19. Describe the appearance and nursing care of a patient suffering from cerebro-spinal meningitis. (Pp. 437, 306.) (*Final, General.*)

20. Describe the appearance and nursing care of a patient suffering from encephalitis lethargica. (P. 438.) (*Final, General.*)

21. Write a description of a case of whooping-cough, and discuss the dangers (if any) connected with this disease. (P. 439.) (*Final, Children's.*)

22. Describe the onset and course of a severe case of whooping-cough. What complications would you look for? (P. 439.) (*Final, Fever.*)

23. Give a short account of the main features and nursing of mumps. (P. 441.) (*Final, General.*)

24. Give the common name for specific parotitis. What are the period of incubation, symptoms of onset, and the complications? (P. 441.) (*Final, Fever.*)

25. What are the earliest signs and symptoms of measles, whooping-cough, influenza? How soon after exposure to infection would you expect the onset in these diseases? (Pp. 435, 439, 441.) (*Final, Fever.*)

26. What are the common symptoms of influenza? How may this disease be spread? (P. 441.) (*Final, Fever.*)

CHAPTER XXVI.

1. By what channels may the bacteria of tuberculosis be given off from the body ? (P. 443.) (*Final, Fever.*)

2. From what sources and by what channels may an individual be infected with tuberculosis ? (P. 443.) (*Final, Fever.*)

3. How does a child become infected with tuberculosis ? Describe the precautions necessary to protect small children from the disease. (Pp. 443-444.) (*Final, Children's.*)

4. What do you understand by the "preventive treatment" of pulmonary tuberculosis ? Give a detailed account of this. (P. 444.) (*Final, General.*)

5. What preventive measures can be taken against tuberculous peritonitis ? (P. 444.) (*Final, General.*)

6. Describe the appearance and symptoms of a patient with advanced pulmonary tuberculosis. What special precautions should be observed in nursing such a patient ? (Pp. 446, 452-454.) (*Scot., Final, General.*)

7. A patient in a ward is found to be suffering from pulmonary "consumption." What precautions would you take to prevent spread of infection ? (P. 452.) (*Final, General.*)

8. What are the special nursing points to remember in pulmonary tuberculosis ? (Pp. 446-457.) (*Final, General.*)

9. Describe the steps to be taken in nursing an active case of pulmonary tuberculosis, with regard to accommodation, feeding, and disinfection. (Pp. 447, 451, 399.) (*Final, General.*)

10. What treatment is most likely to be effective in hæmoptysis complicating a case of pulmonary tuberculosis ? (P. 455.) (*Scot., Final, Fever.*)

11. In a case of pulmonary tuberculosis having a severe hæmoptysis in the ward, what treatment would you apply or make ready for use ? (P. 455.) (*Final, General.*)

12. How would you collect and put up specimens of sputum ? (P. 458.) (*Final, Fever.*)

CHAPTER XXVII.

1. For what purpose is the Wassermann test made ? (P. 461.) (*Final, Fever.*)

2. Describe very briefly the symptoms which may occur in the secondary stage of acquired syphilis. What precautions are to be observed in the management of such a case ? (Pp. 459-460.) (*Scot., Final, General.*)

3. How may congenital syphilis affect (*a*) an infant, (*b*) an older child ? (P. 461.) (*Final, Children's.*)

4. What is meant by the term " snuffles " ? (P. 461.) (*Final, Children's.*)

5. From what parts of the body may contagious or infectious disorders arise ? What precautions would you take in dealing with such patients in a children's ward ? (Pp. 295-298, 388, 462, 616, 89-90.) (*Final, Children's.*)

6. Describe the nursing of a case of gonorrhœal ophthalmia in an infant. Indicate the local treatment. (P. 463.) (*Final, General.*)

7. Describe the rash of erysipelas. At what stage of the disease is the rash seen ? (P. 465.) (*Final, Fever.*)

8. How does the germ of erysipelas enter the body ? What are the symptoms of onset ? Why is the recognition of this disease so important if it occurs in a surgical or obstetric ward ? (Pp. 465, 669.) (*Final, Fever.*)

9. What are the symptoms of tetanus ? How is it most commonly contracted ? What are the main features of treatment from a nursing point of view ? (P. 466.) (*Final, General.*)

CHAPTER XXVIII.

1. What are the signs of inflammation, and how may inflammation terminate ? (Pp. 467-468.) (*Final, Children's.*)

2. A red blush has appeared around a recent wound. What may be the cause of this, and what steps would you take in the care of the case ? (Pp. 465, 470.) (*Final, Children's.*)

3. What do you mean by (*a*) septicæmia, (*b*) pyæmia, (*c*) cellulitis ? Describe in detail the nursing of one of them. (P. 472.) (*Final, Children's.*)

4. Describe any one nursing method used in the treatment of chronic ulcer of leg. (P. 473.) (*Final, General.*)

5. What do you understand by sequestrum ? (P. 474.) (*Final, Children's.*)

6. How are burns classified ? What are the most dangerous kinds, and why ? (P. 475.) (*Final, General.*)

7. In a case of extensive burn by fire, what method of treatment might be adopted, and what are the chief dangers ? (Pp. 477-479.) (*Final, General.*)

8. Describe the immediate treatment and general care of a child suffering with severe scald of the neck and chest. (Pp. 477-479.) (*Final, Children's.*)

9. A small child has received a scald of the mouth and front of the neck and body during an attempt to drink from the teapot. Describe the nursing, care, and feeding of the patient, and what complications may arise ? (Pp. 477-479.) (*Final, Children's.*)

10. How would you nurse a child under four years suffering from extensive scalds ? (Pp. 477-479.) (*Final, General.*)

11. Give in detail the nursing treatment and care of a child aged four years, suffering from scalds involving the front of the neck and chest and right hand, from the time of the accident until recovery. What complications may occur ? (Pp. 477-479.) (*Final, Children's.*)

12. What various forms of injury may be caused by steam and boiling water ? What peculiar dangers may follow ? (Pp. 475-479.) (*Final, General.*)

13. What are the main complications for which you would watch in a case of extensive burns ? (Pp. 476-479.) (*Final, General.*)

14. What apparatus and materials would you get ready for the first after-dressing of an amputation through the thigh ? (P. 484.) (*Final, General.*)

15. What are the various kinds of hæmorrhage ? How would you recognise them, and what treatment should be adopted in each case ? (P. 485.) (*Final, General.*)

16. What would you do, pending the arrival of the house surgeon, in each of the following cases : (*a*) internal hæmorrhage ; (*b*) cut brachial artery ? (Pp. 485, 486-487.) (*Final, General.*)

17. What steps would you take, if a doctor were not available, to check hæmorrhage (*a*) from the femoral artery, (*b*) from a vein in the leg, (*c*) from a leech bite ? (Pp. 486, 488, 193.) (*Final, General.*)

18. What is meant by the term shock ? How may it be set up ? What measures can a nurse employ to counteract shock ? (P. 489.) (*Final, Children's.*)

19. What do you understand by syncope ? (P. 489.) (*Final, Fever.*)

20. What do you understand by the term sarcoma ? (P. 491.) (*Final, Children's.*)

CHAPTER XXIX.

1. What do you understand by the following terms : (*a*) sterilisation, (*b*) surgical cleanliness, (*c*) asepsis, (*d*) antisepsis ? (Pp. 493-495.) (*Preliminary.*)

2. What do you understand by "surgical cleanliness"? State briefly how you would render surgically clean the skin, the hands, dressings. (Pp. 494, 495, 503, 516.) (*Preliminary.*)

3. What do you understand by the following: antisepsis; absorbable sutures? (Pp. 493, 505.) (*Final, Children's.*)

4. What do you understand by asepsis and antisepsis? Give an example of each in dealing with surgical dressings. (Pp. 493-494, 503, 512.) (*Final, Children's.*)

5. How would you sterilise rubber gloves? (Pp. 496.) (*Final, General.*)

6. How would you sterilise or render surgically clean (*a*) glass hypodermic syringe; (*b*) scissors; (*c*) test-tube for uncontaminated specimen of urine? (Pp. 149, 499.) (*Final, General.*)

7. What is the difference between a septic and an aseptic wound? Describe the sterilisation of instruments and dressings in preparation for an operation. (Pp. 494, 499-505.) (*Final, Fever.*)

8. Describe the cleaning of instruments after an operation. How would you sterilise rubber gloves? How would you prepare your hands before assisting at an operation? (Pp. 501, 496, 495.) (*Final, Fever.*)

9. How would you propose to sterilise (*a*) gauze swabs, (*b*) a cataract knife, (*c*) a baby's skin for operation, (*d*) rubber gloves after a septic operation, (*e*) catheters? (Pp. 507, 499, 516, 496, 156.) (*Final, General.*)

10. How would you sterilise (*a*) scissors, (*b*) test-tube for uncontaminated specimen of urine? (P. 499.) (*Final, General.*)

11. How would you prepare and render sterile, dressings, porringers, instruments, gloves? (Pp. 503, 508, 499, 496.) (*Preliminary.*)

12. How would you sterilise (*a*) gauze dressings, (*b*) scalpels, (*c*) silk ligatures, (*d*) rubber gloves, (*e*) your hands? (Pp. 495-506.) (*Final, General.*)

13. Give details how to sterilise as quickly as possible a scalpel and silk sutures. (Pp. 499, 506.) (*Final, Children's.*)

14. What mechanical or chemical means may be used to render the following sterile—dressings, instruments, china or enamel bowls; and how would you prepare your hands previous to dressing a wound? (Pp. 499-504, 508, 495.) (*Preliminary.*)

15. Name three liquid disinfectants, the strength in which each is most generally used, and for what purpose. (Pp. 509-511.) (*Final, Fever.*)

16. Name three of the most commonly employed disinfectants. Give the strength and the purpose for which each are employed. (Pp. 509-511.) (*Preliminary.*)

17. What antiseptics are commonly used in surgical nursing, and in what strength? What are the advantages and disadvantages of each? (Pp. 509-511.) (*Final, General.*)

18. What do you understand by the word antiseptics? Mention those chiefly used, and state what precautions should be taken to prevent accident in connection with the storing of these substances. (Pp. 509, 195.) (*Final, Fever.*)

19. Name six antiseptics. Give the strength in which each is most frequently used, and for what purpose. (Pp. 509-511.) (*Final, Children's.*)

CHAPTER XXX.

1. How would you prepare a girl of ten years of age for a mastoid operation under a general anæsthetic? (Pp. 514-517.) (*Final, Fever.*)

2. How would you prepare a child for an abdominal operation? (Pp. 514-517.) (*Final, Children's.*)

3. How would you prepare a patient for an abdominal operation? State clearly the most important points in the post-operative care of the same. (Pp. 514-517, 534-536.) (*Final, General.*)

4. How would you prepare a patient for a general anæsthetic? What articles would the anæsthetist require on his trolley? (Pp. 514-517, 524.) (*Final, Children's.*)

5. You are sent to a private house to prepare for an abdominal operation on a child. What equipment would you require, and what preparations would you make? (Pp. 527-529, 514-517.) (*Final, Children's.*)

6. How would you prepare for an emergency operation in a private house? (Pp. 527-529.) (*Final, Children's.*)

7. You are sent at 8 P.M. to a private house in which an operation for appendicitis is to be performed at 2 P.M. on the following day. Describe fully the preparation of the patient and of the room. (Pp. 527-529, 514-517.) (*Final, General.*)

8. What do you understand by the term Fowler's position? (P. 530.) (*Final, Children's.*)

9. Describe how you would prepare a child of four for an operation for removal of glands from the neck. Give the principal nursing points in the post-operative care of such a case. (Pp. 514-517, 563.) (*Final, Children's.*)

10. Write a short essay upon the causation, prevention, and treatment of post-operative pneumonia. (Pp. 530, 267.) (*Final, General.*)

11. Give an account of the means employed to prevent and treat post-operative shock. (Pp. 530, 489.) (*Final, General.*)

12. State what you know of post-operative acidosis. What steps have you seen taken to prevent its occurrences ? (P. 531.) (*Final, Children's.*)

13. What is meant by the term acidosis ? (Pp. 335, 531.) (*Final, Children's.*)

14. What would be your care of a patient returning to the ward from the theatre after an abdominal operation ? (Pp. 529-536.) (*Preliminary.*)

15. Discuss the general principles involved in the treatment of an acute abdominal case. Give details of the nursing of such a case. (Pp. 529-536.) (*Final, Children's.*)

16. A nurse is in sole charge of a patient who has had laparotomy performed. What are the details she should report to the doctor at his visit eight hours after the operation ? (Pp. 534-536.) (*Final, General.*)

17. Describe fully how you would prepare for, carry out, and clear up after the dressing of an appendix abscess. (P. 536.) (*Final, General.*)

18. Describe the routine methods you would adopt in carrying out the daily dressings in a surgical ward which contains some patients with clean wounds and others with infected wounds. (Pp. 536, 485.) (*Final, Children's.*)

19. Under what conditions may the position in which the child is nursed be of importance ? Mention the chief positions employed in children's nursing. (Pp. 529, 538, 585, 589, 250, 265, 311, 410, 423, 448.) (*Final, Children's.*)

CHAPTER XXXI.

1. What would you do pending the arrival of the house surgeon in a case of appendicular abscess ? (P. 538.) (*Final, General.*)

2. Describe the immediate pre-operative and post-operative nursing of a case of acute appendicitis in a young child. (P. 538.) (*Final, Children's.*)

3. Describe in detail the nursing of a case of suppurative appendicitis before and after operation. (P. 538.) (*Final, Children's.*)

4. What are the important complications that may occur after an operation for gastro-jejunostomy ? (P. 540.)
(*Final, General.*)

5. What is the operation known as colostomy ? For what is it usually performed ? What is the nursing treatment ? (P. 542.) (*Final, General.*)

6. Give in detail the nursing of an infant following the operation for pyloric stenosis. Breast milk is available. (P. 543.) (*Final, Children's.*)

7. Give in detail the nursing and care of a baby aged six weeks in an infants' ward during the week following an operation for pyloric stenosis. Breast milk is available. (P. 543.)
(*Final, Children's.*)

8. Give in detail the feeding of a case of pyloric stenosis during the three weeks following operation. The baby is six weeks old, and weighed 7 lb. just before the operation. There is no breast milk available. (P. 543.)
(*Final, Children's.*)

9. What is meant by empyema ? Enumerate the instruments that would be required at an operation for empyema, and describe the after-treatment. (P. 544.)
(*Final, General.*)

10. What do you know about the causes of empyema ? Describe the treatment and nursing of any case of empyema you have nursed. (Pp. 264, 544.) (*Final, Children's.*)

11. You are in charge of a child recovering from an anæsthetic after drainage of an empyema. Describe exactly your procedure, and mention what complications you would watch for before consciousness returns. (Pp. 529-534, 545.)
(*Final, Children's.*)

12. What do you understand by the term hernia ? Where is it commonly met with, and what are the chief causes ? (P. 546, 384.) (*Final, Children's.*)

13. Describe fully the preparation for operation and the post-operative nursing of a child of three years with inguinal hernia. (Pp. 514-517, 529-534, 547.) (*Final, Children's.*)

14. What is a hernia ? Explain the terms reducible, irreducible, and strangulated. What steps would be taken in each case to relieve the patient ? (Pp. 546-548.)
(*Final, General.*)

15. What are the common forms of hernia occurring in childhood ? State what you know of the complications which may arise. (Pp. 546-548, 384.) (*Final, Children's.*)

16. Write an account of the nursing of a patient who has undergone an operation for gall-stones. (P. 551.)
(*Final, General.*)

17. What are the important complications that may occur after the operation of prostatectomy ? (P. 556.) (*Final, General.*)

18. Describe exactly the post-operative nursing of a case of circumcision. What complications may be encountered ? (P. 557.) (*Final, Children's.*)

19. What are the important complications that may occur after the operation of circumcision ? (P. 557.) (*Final, General.*)

20. Describe fully the post-operative nursing of a man who has had half his tongue removed for epithelioma. (Pp. 529-534, 559.) (*Final, General.*)

21. What special points are to be observed in nursing a case of hare-lip and cleft palate before and after operation ? (Pp. 379-380, 559-560.) (*Final, Children's.*)

22. How would you feed a child after operation for (*a*) cleft palate, (*b*) hare lip ? (Pp. 559-560.) (*Final, Children's.*)

23. Describe fully the nursing of a child after an extensive operation for the relief of a brain tumour. Mention the daily observations you would make in respect of the wound and of the child. (P. 561.) (*Final, Children's.*)

24. What are the important complications that may occur after an operation for Grave's disease ? (P. 563.) (*Final, General.*)

25. You are in charge of a child recovering from an anæsthetic after excision of glands of the neck. Describe exactly your procedure, and mention what complications you would watch for before consciousness returns. (Pp. 529-534, 563.) (*Final, Children's.*)

26. What are the chief causes of irregular enlargements of the breast ? What advice would you give to a patient with such condition if she applied to you ? (P. 564.) (*Final, General.*)

27. Write how you would prepare everything necessary for a subcutaneous tenotomy. Mention the situations in the body in which you have seen such an operation performed. (Pp. 565, 127.) (*Final, Children's.*)

CHAPTER XXXII.

1. Enumerate the varieties of fractures. Give a short description of each. What are the special dangers that may result from them ? (P. 566.) (*Final, General.*)

2. What is meant by green-stick fracture ? (P. 567.) (*Final, Children's.*)

3. A child has met with a fall. You happen to be the first to examine the child. What signs would lead you to believe that the child had seriously injured himself ? (Pp. 567, 235, 489.) (*Final, Children's.*)

4. What would you do if required to render first aid in a case of broken tibia ? What would you get ready in the ward for the surgeon at his visit ? (Pp. 567-570, 122.) (*Final, General.*)

5. What are the main complications you would watch for in a case of (*a*) compound fracture, (*b*) fracture of the neck of the femur in an elderly patient, (*c*) concussion of the brain ? (Pp. 571-572, 235.) (*Final, General.*)

6. Give the symptoms and signs of a simple fracture of the shaft of the femur. What are the recognised varieties of simple fractures ? (Pp. 567, 572.) (*Final, General.*)

7. What is the object in using the "gallows" method in treating a fractured femur in an infant ? Describe fully the nursing of such a case. (Pp. 572-573.) (*Final, Children's.*)

8. What preparations would you make for the surgeon's visit in the case of a child suffering from fractured femur ? Mention the chief points to be observed in the subsequent nursing of such a case. (Pp. 573, 128, 130.) (*Final, Children's.*)

9. What are the principal results of injuries to the spine, and how would you nurse such a case after operation ? (Pp. 573-575.) (*Final, General.*)

10. How would you nurse a case of fracture of the spine ? (Pp. 573-575.) (*Final, General.*)

11. What are the various forms of fracture of the skull ? How are they caused ? Describe the symptoms, signs, and complications. (P. 577.) (*Final, General.*)

12. A child is admitted to hospital following a fall on to the head. By what signs would you suspect serious injury ? How would you handle such a case ? (Pp. 235, 577.) (*Final, Children's.*)

13. Describe the various forms of fracture of the clavicle. Describe the process of repair, and indicate any irregularities of union and disabilities that may occur. (Pp. 578, 567.) (*Final, General.*)

14. What is a Colles's fracture ? How is it most commonly caused ? To what deformity does it often give rise ? What splints would you prepare for treatment ? (Pp. 578, 123.) (*Final, General.*)

15. What is meant by the term "Pott's fracture" ? How is this fracture caused ? How is it treated ? What deformity and disability may ensue if it is unskilfully treated ? (P. 578.) (*Final, General.*)

16. Describe any one nursing method used in synovitis of the knee. (Pp. 579-581.) (*Final, General.*)

17. What is meant by dislocation? Describe what happens when a shoulder is "put out." What complications may follow? (P. 580.) (*Final, General.*)

18. What are the early symptoms of tuberculous disease of the spine? Describe the course of the disease and the nursing treatment. (Pp. 582-587.) (*Final, Children's.*)

19. Describe the nursing and care of a child under treatment for spinal caries. (Pp. 582-587.) (*Final, Children's.*)

20. Describe the nursing of a case of cervical caries in a plaster bed. (Pp. 582, 587, 600.) (*Final, Children's.*)

21. What are the early signs of hip disease? Describe what you know of the nursing and care of such cases. (Pp. 587-590.) (*Final, Children's.*)

22. What is meant by talipes? (P. 592.) (*Final, Children's.*)

23. What do you understand by Erb's paralysis? (P. 594.) (*Final, Children's.*)

24. Name not less than four of the most common deformities met with in children, and give the treatment in detail of any one of them. (Pp. 592-599.) (*Final, Children's.*)

25. Give three instances of acquired and three of congenital deformities occurring in children. Give the nursing of any one of these. (Pp. 583-599.) (*Final, Children's*)

26. What do you understand by acute osteomyelitis of the tibia? What would the child complain of, and what would you notice about the child and the condition of the leg? How is such a condition usually treated? (P. 600.) (*Final, Children's.*)

CHAPTER XXXIII.

1. In a case of septic sore throat what (*a*) local and (*b*) general treatment is recommended? (P. 601.) (*Final, General.*)

2. What are the more important complications of (1) chronic tonsillar infection, (2) otitis media; and what indications would make you think they were present? (Pp. 601, 327, 610, 305, 309.) (*Final, General.*)

3. How would you prepare a child for the operation for removal of tonsils and adenoids, and describe the immediate after-care. (Pp. 514-517, 603-604.) (*Final, Children's.*)

4. How would you feed a child after observation for removal of tonsils and adenoids? (P. 604.) (*Final, Children's.*)

5. What will be your care of a child who has had an operation for the removal of tonsils and adenoids (*a*) immediately after operation, (*b*) during convalescence ? (P. 604.)
(*Final, General.*)

6. You are in charge of a child recovering from an anæsthetic after removal of tonsils and adenoids. Describe exactly your procedure, and mention what complications you would watch for before consciousness returns. (Pp. 529-534, 604.)
(*Final, Children's.*)

7. What amount of bleeding following an operation of the mouth, nose, or throat would make you send for the doctor ? What steps would you take pending his arrival ? (Pp. 560, 604, 609.) (*Final, Children's.*)

8. How would you prepare for tracheotomy ? (Pp. 605, 412.) (*Final, Children's.*)

9. Describe in detail the preparation to be made for the operation of tracheotomy. (Pp. 605, 412.)
(*Final, Fever.*)

10. How would you prepare for examination of the larynx of a patient confined to bed ? (P. 605.) (*Final, General.*)

11. Give the symptoms, signs, and causes of nasal catarrh in childhood. What preventive precautions would you take in the case of healthy children ? (P. 607.) (*Final, Children's.*)

12. How would you prepare for examination of the ear of a patient confined to bed ? (P. 609.) (*Final, General.*)

13. In what acute infectious diseases is inflammation of the middle ear (otitis media) liable to occur ? What are the symptoms, signs, and usual course of the complaint ? (P. 610.)
(*Final, Fever.*)

14. What do you mean by otorrhœa ? Is this a serious condition, and if so, why ? (P. 610.) (*Final, Children's.*)

15. What are the main complications for which you would watch in a case of mastoid suppuration ? (P. 610.)
(*Final, General.*)

16. How would you prepare for examination of the eye of a patient confined to bed ? (P. 611.) (*Final, General.*)

17. Describe in detail the nursing treatment required for a case of infective purulent ophthalmia. (Pp. 464, 615-617.)
(*Final, General.*)

18. What may cause conjunctivitis ? Describe the nursing treatment of an unilateral case. (P. 616.)
(*Final, Children's.*)

19. From what parts of the body may contagious or infectious discharges arise ? What precautions would you take in dealing with such patients in a children's ward ? (Pp. 295-298, 388, 462, 616, 89-90.) (*Final, Children's.*)

20. What do you understand by cataract? Describe the nursing of a patient after removal of same. (Pp. 618-620.) (*Final, General.*)

CHAPTER XXXV.

1. Write a short account of the anatomy of the female organs of reproduction, and indicate the changes occurring therein at various ages. (P. 635.) (*Final, General.*)

2. Describe the anatomy of the bones of the pelvis, and give the differential points of this between the male and female. (P. 635.) (*Final, General.*)

3. Describe the position of the uterus, bladder, and rectum in the pelvis. What changes are caused by an over-distended bladder? (P. 635.) (*Final, General.*)

4. What is amenorrhœa? Discuss its usual causes. (P. 639.) (*Final, General.*)

5. What do you mean by menorrhagia, dysmenorrhœa, and atresia? (Pp. 639-640, 642.) (*Final, General.*)

6. What are the common varieties of vaginal discharge, and how are they distinguished? (P. 641.) (*Final, General.*)

7. What are the common causes of uterine hæmorrhage? Indicate the treatment appropriate in each case. (Pp. 643-646.) (*Final, General.*)

8. Describe the causes of uterine hæmorrhage. What are the methods usually employed in dealing with it? (Pp. 643-646.) (*Final, General.*)

9. What is meant by the term retroversion? What symptoms does this condition cause, and how is it treated? (P. 643.) (*Final, General.*)

10. What is meant by uterine prolapse? (P. 644.) (*Final, General.*)

11. In a case of prolapse or partial prolapse of the uterus, what can be done to relieve the patient? (P. 644.) (*Final, General.*)

12. What are the symptoms of uterine fibroids? At what period of life do they commonly occur, and what advice would you give? (P. 645.) (*Final, General.*)

13. What can be done, from a nursing point of view, to alleviate the sufferings of a woman who has an inoperable growth of the uterus? What are the usual causes of growth in this condition? (P. 646.) (*Final, General.*)

14. What means would you take to overcome the offensive smell of malodorous wounds, or due to conditions associated with disease? (P. 646.) (*Final, General.*)

15. What signs and symptoms would lead you to suspect that a patient is suffering from ruptured ectopic gestation ? (P. 647.)
(*N. Ireland, Final, General.*)

16. What is cystitis ? How may it be caused ? (P. 650.)
(*Final, Fever.*)

17. How would you make a vaginal tampon ? What are they used for, and how are they inserted ? (P. 653.)
(*N. Ireland, Final, General.*)

18. How would you sterilise or render surgically clean a vulcanite pessary ? (P. 654.) (*Final, General.*)

19. Describe the preparation required for nursing a case of hysterectomy. Mention the most important points in the after-treatment. (Pp. 659-660). (*Final, General.*)

20. Describe the special preparation of a patient on whom hysterectomy is to be performed, and give the after-care. What complications may arise ? (Pp. 514-517, 659-661.)
(*Final, General.*)

21. Describe fully the nursing and care of a patient after an operation for perineorrhaphy (perineal repair). (P. 659.)
(*Scot., Final, General.*)

22. What instruments are necessary for the operation of curettage ? Describe the local treatment and nursing after the operation. (Pp. 658, 660.)
(*Scot., Final, General.*)

23. Describe any one nursing method used in the treatment of thrombosis of the leg. (P. 661.) (*Final, General.*)

CHAPTER XXXVI.

1. What is meant by puerperal infection ? How is it conveyed and how avoided ? (P. 669.) (*Final, General.*)

2. How may puerperal fever be caused ? What should a nurse observe and report in a case of this disease ? (Pp. 669-671.) (*Final, Fever.*)

3. What is meant by eclampsia ? Give the causes, symptoms, signs, and dangers. (P. 671.) (*Final, General.*)

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Wrist, tuberculous, 591.

X-rays, 630.

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